MODELING AND ANALYSIS OF COMPLEX TECHNOLOGY ADOPTION DECISIONS: AN INVESTIGATION IN THE DOMAIN OF MOBILE ICT

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MODELING AND ANALYSIS OF COMPLEX TECHNOLOGY ADOPTION DECISIONS: AN INVESTIGATION IN THE DOMAIN OF MOBILE ICT

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To my parents

Your willing sacrifice, boundless support, and unending love made this journey possible.

For that, I am forever grateful!

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LIST OF ABBREVIATIONS

B2B	Business to Business
B2C	Business to Consumer
B2E	Business to Employee
CRM	Customer Relationship Management
DOI	Diffusion of Innovation
DSS	Decision Support Systems
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
GPS	Geographic Positioning System
ICT	Information and Communication Technologies
IS	Information Systems
ISDN	Integrated Services Digital Network
KM	Knowledge Management
MIS	Management Information Systems
PDA	Personal Digital Assistant
PIM	Personal Information Management
RDT	Readiness Diagnostic Tool
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SFA	Sales Force Automation
VOIP	Voice over Internet Protocol

SUMMARY

Mobile information and communication technologies (ICT) promise to significantly transform enterprises, their business processes and services, improve employee productivity, effectiveness, and efficiency, and create new competitive advantages and business agility. Despite the plethora of potential benefits, however, widespread enterprise adoption of mobile ICT has not been as extensive as initially anticipated. Drawing on the extant information systems, technology management, and organizational innovation literature, this dissertation investigates the salient drivers and inhibitors of emerging ICT adoption, in general, and mobile ICT in particular, and develops an integrative ICT adoption decision framework. From this synthesis we identify four broad elements that influence an enterprise's decision to adopt mobile ICT: (1) business value, (2) costs and economics, (3) strategic alignment, and (4) enterprise readiness. The latter decision element has received only little theoretical and practical attention. In order to fill this gap, this dissertation explored the concept of enterprise readiness in further detail and identified eight key dimensions and their associated assessment indicators. Using a two-stage expert study and experimental design approach, we empirically validated these dimensions and determined their relative importance. Results indicated that leadership readiness followed by technology, data and information, and resource readiness, contributed the most to enterprise readiness for mobile ICT. The results are implemented into a web-based readiness diagnostic tool (RDT) that enables decision makers to assess an enterprise's readiness for mobile ICT. The benefits of the RDT are multifold: first, it navigates the decision maker through the complex readiness assessment space; second, it identifies potential organizational deficiencies and provides a means to assess potential sources of risks associated with the adoption and implementation of mobile ICT; and third, it enables decision makers to benchmark their level of readiness against other organizations. The dissertation concludes by highlighting both theoretical and practical implications for emerging and mobile ICT adoption management and suggesting directions for future research.

CHAPTER 1:

INTRODUCTION

1.1. Introduction

Information and communication technologies (ICT) have become an increasingly integral component of today's enterprises. ICT are ubiquitous and enable a degree of connectivity that was difficult to envisage just a few years ago (Basole & DeMillo, 2006). ICT have evolved rapidly, resulting in significant advances in capabilities and thus business options. Over the past decade, many organizations have adopted and implemented net-enabled enterprise solutions, such as enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), and knowledge management (KM) to improve their overall effectiveness and efficiency (Turban, McLean, & Wetherbe, 2004). Indeed, ICT have enabled organizations to maintain and create new competitive advantages, communicate and interact more efficiently with partners, suppliers, and customers, improve business productivity, create flexible workflows, and decrease operational costs (Hammer & Mangurian, 1987; Ward & Peppard, 2002).

The emergence of new ICT promises enterprises even greater opportunities. Wireless sensor technologies, real-time computing, web services, voice over IP (VOIP), mobile business solutions, biometric security systems, and artificial intelligence solutions are only a few examples of next-generation enterprise ICT that are on the cusp of becoming main stream (Evans, 2002b). Each of these ICT provide unique capabilities that can significantly transform enterprises, their products and service offerings, their business model, and even their respective industries and markets (Venkatramam, 1994; Rouse, 2005b; Basole & DeMillo, 2006).

However, while new ICT come and go, organizations still face the same dilemma they have had for years: identifying, adopting, and implementing the "right" solutions for their current and future business needs (Ward & Peppard, 2002). Particularly in times where ICT budgets have significantly tightened and clearly identified and proven business cases are essential, executives and decision makers must make informed technology adoption and implementation decisions before making substantial investments (Ward & Peppard, 2002).

This decision is further complicated by numerous other forces: alignment with business strategy, integration with existing systems and infrastructures, global competition, influences of suppliers, partners, and customers, etc. All in all, today's ICT decision makers face tremendous pressure not to miss critical business opportunities as well as not to make ICT investments that fail to deliver business value and expected benefits (Barua, Konana, Whinston, & Yin, 2004).

1.1.1. The Complexity of ICT Adoption Decisions

The adoption and implementation of ICT continues to be an interesting research topic. Advances in ICT provide organizations with a plethora of potential opportunities to increase efficiency, lower costs, and improve business value (Christensen, 2004; ExtendedSystems, 2004b; Basole & DeMillo, 2006).

As ICT become an increasingly integral aspect of organizations, decision makers must understand the forces and factors that shape the adoption and implementation decision. However, this decision is far from simple. In today's dynamic, global, and highly competitive business environment, executives and IT decision makers must make smart and value-justified decisions about their technology investment and strategy (Rouse, Howard, Carns, & Prendergast, 2000; Ward & Peppard, 2002). Organizations must carefully assess their current state of technology, determine potential gaps, identify opportunities, evaluate a range of ICT options, and select the right solution(s) that can meet their immediate needs and align with their long-term business goals.

In many cases, technology adoption decisions are further complicated by competitive pressures, regulatory influences, customer requirements, and supplier forces. Indeed, contextual factors often shape the decisions organizations make with respect to their ICT investments. The complexity of the technology decision increases even further when the ICT under consideration is just emerging and its value is still not known (Easton, 2002; Kornak, Teutloff, & Welin-Berger, 2004; Daley, 2005). In this dissertation we investigate the complexity of technology adoption in one such case, namely mobile ICT.

1.1.2. Enterprise Readiness for ICT

As the previous section highlighted, the adoption of ICT is dependent on several decision elements. These can be broadly defined as the business value of ICT, cost/economics, strategic alignment, and enterprise readiness, and are elaborated on in Chapter 4. The first three elements have received considerable attention in the literature. The last element, enterprise readiness, however, is relatively unexplored. The focus of this dissertation is thus on exploring and validating the salient dimension of enterprise readiness, its relative importance, and associated assessment indicators (see Chapters 5-

7). In particular, this research is focused on the nature of readiness rather than how much readiness an organization needs to achieve particular objectives.

Using the metaphor of health, enterprise readiness can be viewed as an organization's "fitness" to pursue ICT adoption. Consider the ambition of a mountain climber. A mountain climber may see a tremendous value in climbing and conquering Mount Everest (business value); the expedition is justified from a cost perspective (cost/economics); and it aligns with his or her personal goals (strategic alignment). However, he or she may not be healthy or fit enough (enterprise readiness) to pursue such a complex, difficult, and challenging endeavor.

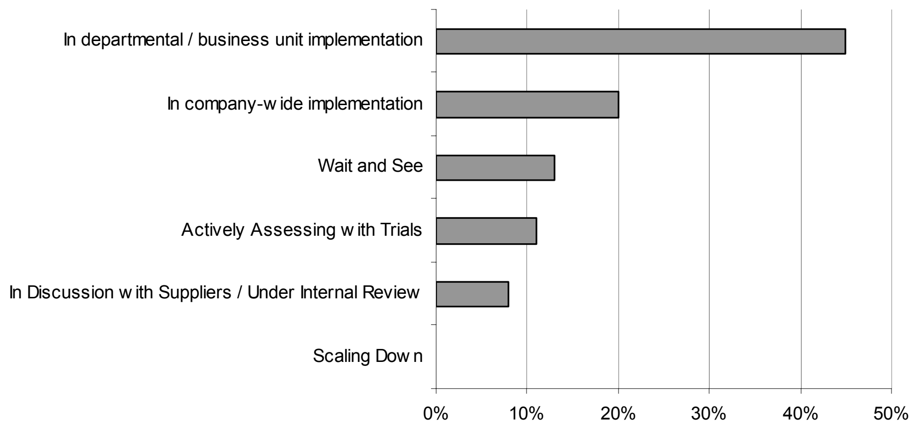
Enterprise adoption of ICT can therefore be compared to the ambition of the mountain climber to climb a mountain. The higher the "fitness" level of the mountain climber, the more efficiently and easier he or she can climb up the mountain. Similarly, an enterprise that is more ready, can more effectively and efficiently adopt and implement ICT. The objective of this dissertation is thus not to understand how much readiness an organization needs, but to explore the nature of readiness itself.

1.1.3. The Research Context: Mobile ICT

In traditional computing environments it was necessary to come to the computer to perform work on it. Computers were connected to each other, to networks, mainframes, servers, printers, and other equipment via wires. This scenario limited the use of computers to people working in an office and presented difficulties for professionals and workers in the field and on the move. In particular, mobile professionals and workers, such as executives, salespeople, utility workers, law enforcement agents, insurance representatives, and service employees can be more effective if they can use ICT while at their jobs in the field or in transit (Faigen, Fridman, & Emmett, 2002).

The first solution was to make computers small enough so they can be easily carried around. Laptops, PDAs, and other handhelds are examples of this first generation of mobile devices. These mobile devices enabled mobile workers to download and upload information from or to a desktop computer via wired synchronization processes and access them in the field. These devices provided the first application of mobile computing, a new computing paradigm designed for workers who travel outside the boundaries of their organizations or for anyone on the move. Salespeople were able to make proposals at customers' offices; a traveler could read and answer all of the day's e-mails while on the road (Kalakota & Robinson, 2001; Keen & Mackintosh, 2001).

The second solution to the need for mobile computing was to replace wires with wireless communications. The next solution was a combination of the first two, namely to use mobile devices in a wireless environment. Referred broadly to as mobile ICT, this combination enables a real-time connection between mobile devices and other computing environments, such as the Internet or an intranet. Primary growth of mobile ICT solutions was witnessed at the consumer level (Ferguson & Pike, 2001; Anckar & D'Incau, 2002; Junglas & Watson, 2003). However, it is also rapidly seeping into the enterprise domain. Recent market research studies have suggested that there will be more than 50 million mobile workers in the United States by the end of 2006, spending more than 20% of their time away from their primary workspace (Lee, 2003). Of these 50 million workers, 35 million are said to be "white collar" mobile professionals, such as executives, managers, consultants, physicians, and nurses (Lee, 2003). Indeed, mobile ICT solutions are being used in areas such as commerce, education, health care, hospitality, and entertainment (Kalakota & Robinson, 2001; Paavilainen, 2001; Evans, 2002a; Faigen et al., 2002; Kornak et al., 2004).



* No company reported a scaling down of mobile ICT solutions.
Source: Deloitte Research, 2004

Figure 1. Current State of Mobile ICT Usage

More and more organizations are realizing that mobile ICT have the ability to provide a range of new value opportunities. Value can come from providing basic mobile connectivity to the workforce, productivity improvements from mobilizing business processes, and real-time insight and greater visibility to business operations. Indeed, a growing number of organizations are adopting and implementing mobile ICT solutions at various levels, ranging from group, to organizational to enterprise-wide deployments (see Figure 1).

Many organizations that have implemented mobile ICT solutions report tangible benefits and improvements in productivity, convenience, cost reductions, and revenue gains

(Hayes & Kuchinskas, 2003). Deployments are generally found among sales and field force professionals, as well as IT staff, and customer service representatives (see Figure 2).

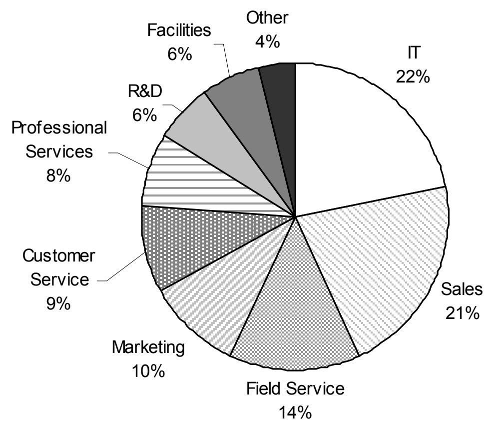


Figure 2. Enterprise Areas of Mobile ICT Implementations

Given this overall trend, it is not surprising that mobile ICT spending is growing steadily. Nevertheless, there still exists some uncertainty over the business value of mobile ICT. In the majority of enterprises, mobile ICT solutions remain a discretionary activity; most mobile ICT deployments have focused on basic mobile enablement - providing mobile connectivity to existing applications and existing devices. In terms of ICT priorities, mobile ICT solutions are still regarded a “nice to have”, not a “need to have”. These non-committal attitudes towards mobile ICT solutions are explained somewhat by enterprises’ relatively poor understanding of the technology. Potential security problems, lack of interoperability with existing infrastructure, and issues of data and device management are other commonly cited technology challenges (Gohring, 2006). In addition, inadequate preparations have both delayed deployment and permitted large-scale implementations. From a strategic and economic perspective, there is still no clear business case, often times there are conflicts with other ICT spending priorities, and questions about the fit and alignment with strategy. The use of mobile ICT in enterprises is thus still in its infant stage. Only little theoretical work has been done in understanding how mobile ICT can impact and transform enterprises (Scornavacca, Barnes, & Huff, 2006). Similarly, only little is known on how enterprises adopt and implement mobile ICT (Fouskas, Giaglis, Kourouthanassis, Karnouskos, Pitsillides, & Stylianou, 2005). Since the question is not if or when mobile ICT will be used in enterprises, but rather why and how organizations will adopt and implement mobile ICT, the objective of this dissertation is to explore the latter two issues further.

1.2. Dissertation Objectives

The previous sections have provided the starting points of this study. First, this dissertation is motivated by organizations' ongoing need to create and sustain competitive advantages, decrease costs, and improve productivity in an increasingly competitive and global environment through the use of ICT. Second, theories of technology adoption and enterprise transformation provide a perspective on the drivers, barriers, and potential opportunities for achieving these goals through ICT, however the impact of emerging ICT, such as mobile ICT, are not well understood. Third, adoption and implementation of emerging ICT come with a range of organizational risks. From a practitioners' perspective it is thus desirable to identify the sources of risks and organizational deficiencies and take appropriate measures to minimize them.

The objective of this dissertation is to contribute to our understanding of enterprise adoption decisions of ICT with an investigation in the domain of mobile ICT. Within this general research objective the following three research questions are posed:

1. Why should enterprises care about mobile ICT?
2. What are the key determinants of enterprise adoption of mobile ICT?
3. What makes an enterprise "ready" to adopt/implement mobile ICT?

The first research question relates to the issue of the business value of mobile ICT. Specifically, it explores the costs and benefits associated with the adoption of mobile ICT and determines how mobile ICT can and/or will transform enterprises. The second research question investigates the underlying determinants that explain enterprise adoption behavior. The third question relates to the issues of organizational preparedness, potential, and willingness to adopt and implement mobile ICT. In particular, it identifies the key dimensions associated with enterprise readiness, determines their relative importance, and identifies assessment indicators with which to measure them.

1.3. Dissertation Outline

The remainder of this dissertation is organized as follows and outlined in Figure 3. In Chapter 2, we provide an informative synopsis of the value, impact, and current use of mobile ICT in enterprises. Specifically, we develop a framework that highlights the transformational impact of mobile ICT, describe the plethora of benefits enterprises can achieve today, and speculates about potential future opportunities. We also discuss potential challenges and difficulties enterprises may experience by adopting mobile ICT. In Chapter 3, we provide the theoretical backdrop of this dissertation by reviewing the extant literature on technology adoption from a multi-lens perspective and summarizing salient theories and frameworks.

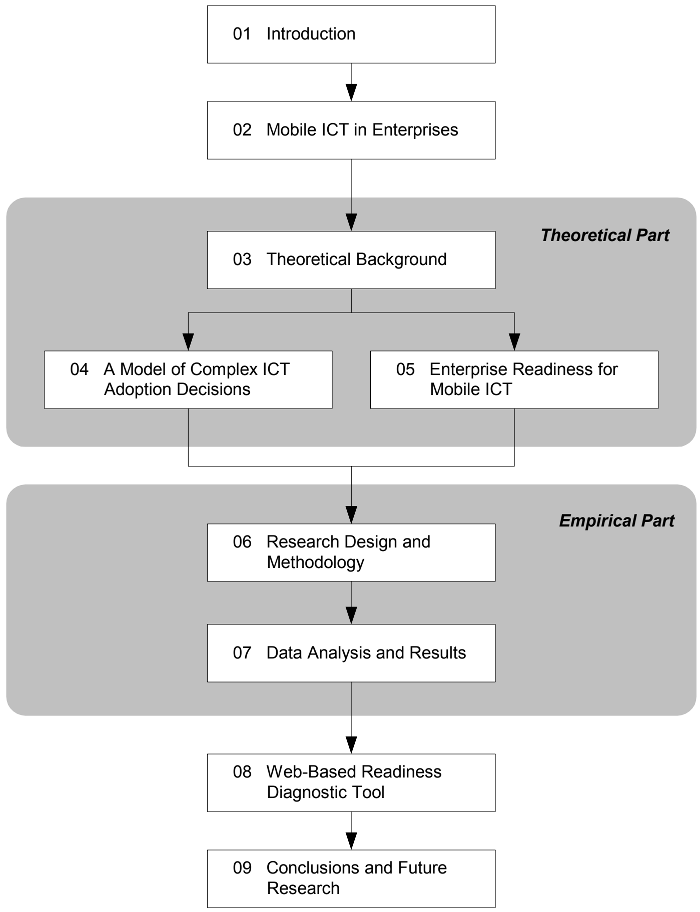


Figure 3. Dissertation Outline

Based on the results of this analysis, we develop an integrative model of complex ICT adoption and identify and describe the key underlying elements of the mobile ICT adoption decision in Chapter 4. In Chapter 5, we elaborate on one relatively unexplored decision element, namely enterprise readiness, and describe its key dimensions and associated assessment indicators. Chapter 6 describes the research design and methodology we used to empirically validate the aforementioned readiness dimensions and assessment indicators. In particular, we describe the expert study and experimental design of our web-based approach and present our study instrument. Chapter 7 presents the data analysis and results and discusses our key findings. Drawing on the results of our empirical study, we then develop a web-based readiness diagnostic tool (RDT) that aids decision makers in assessing enterprise readiness for mobile ICT. Chapter 8 describes the development and implementation of the RDT and highlights its main features. The dissertation concludes in Chapter 9 by summarizing our key results, presenting our contributions to theory and practice, and discussing directions for future research.

CHAPTER 2:

MOBILE ICT IN ENTERPRISES

2.1. Introduction

The logic for enterprise adoption of mobile ICT is well recognized. Any technology that can deliver a tangible business benefit, by making information more accessible, is a good thing. The promises of mobile ICT solutions certainly fall into this category. However, in early 2000, when enterprises first began to evaluate and adopt mobile ICT solution, the technology was still fairly immature and often failed to deliver the expected benefits (Daley, 2005). The predictable outcome was widespread disappointment. Many labeled mobile ICT to be another hyped up technology with little substance (Cosgrove, 2005).

Today, much has changed. The underlying technology has improved significantly. The pieces of the mobile data equation, which we refer to as the mobile DNA (devices, network infrastructure, and applications), are falling into place: devices are becoming more suited for mobile data use, network infrastructure is maturing and becoming capable of handling higher data throughput, and value-added applications are rapidly emerging (EBStrategies, 2003; Air2Web, 2004; Worthen, 2004). While the initial growth of mobile ICT adoption has occurred in the consumer market, a similar trend has also seeped into the enterprise domain (Hartman & Sifonis, 2000; Lee, 2003). Enterprises are realizing the tremendous potential of mobile ICT. The use of mobile ICT in enterprises has evolved from being simplistic point solutions and small projects focused on productivity improvements and costs savings to strategic and large-scale enterprise-wide implementations that enable organizations to create new core competencies, gain and sustain competitive advantages, and define new markets (Heck, 2004; Kornak et al., 2004). Previous studies have indeed shown that mobile ICT will allow organizations to meet their most fundamental objectives: improve productivity, get closer to their customers and stakeholders, be more responsive, and increase business agility (Kalakota & Robinson, 2001; Easton, 2002; Faigen et al., 2002; Lyytinen & Yoo, 2002).

Mobile ICT has also led to the promise of the "adaptive" organization (Evans, 2002a). The rise of an increasingly mobile workforce is transforming the rules of engagement in the corporate world. Companies are staking their competitive strategies on keeping their information workers connected – to customers, partners, and internal teams – in order to respond quickly to changing market conditions (ExtendedSystems, 2004a).

For executives, managers and salespeople who are on the road, or employees working in remote and occasionally connected locations, mobile ICT offers increased productivity while enabling "high-touch" customer service (Hayes & Kuchinskas, 2003). With the availability of more powerful mobile ICT, organizations can now unify their back office, front office and "no office" processes, achieving a degree of collaboration that was never before possible (Ferguson & Pike, 2001).

The promise of mobile computing creates an adaptive organization – one that is flexible and dynamically changeable in both business processes and technology. Adaptive enterprises can rapidly integrate new resources or reallocate existing resources to immediately solve business problems or preempt competitive threats. It is an approach that is already having a dramatic impact on business productivity and profitability (Worthen, 2004).

Based on these initial success stories, there is little doubt that mobile ICT will have a profound and transformational impact on the way business is done (Evans, 2002a). However, the new "way" is still emerging, and the path for how enterprises can get there is still unclear (Daley, 2005).

Despite the tremendous potential value and impact of mobile ICT in enterprises, its widespread adoption has not been as extensive as initially anticipated (Daley, 2005). Technology maturity, integration and compatibility issues, security, and implementation costs are some of the commonly cited concerns (Gohring, 2006). However, as more enterprises transition to mobility, it will become increasingly apparent that the technology aspect will be the least difficult issue to resolve. Successful adoption and implementation of mobile ICT will require significant changes in an organization, its current business practices, culture, processes, and workflows (Basole, 2005). Similar to previous studies on ICT adoption, it will also require top management vision and support. Along the same lines, successful implementations will also require the availability of proper human, technical, and financial resources. Since the adoption of ICT occurs at both the organizational and individual level, an understanding of end-user attitudes to change is important as well. For organizations planning on adopting mobile ICT, it is therefore of critical importance not to only understand the value and transformational impact of enterprise mobility, but also to carefully measure and evaluate their overall preparedness to adopt and implement mobile ICT (Smith, 2002; Basole, 2004; Nah, Siau, & Sheng, 2005; Passerini & Patten, 2005; Unhelkar, 2005).

The objective of this chapter is to provide the readers a comprehensive view of the value and impact of mobile ICT, and illustrate current application areas of mobile ICT. In order to do so, the chapter begins by defining the concept of mobility as applied to the enterprise domain. Next, we identify the unique characteristics and attributes of mobile ICT that distinguish it from its wired counterpart, and describe benefits derived from mobile ICT. We then proceed to describe some commonly identified categories of mobile workers and typical mobile ICT solutions deployed in enterprises today. Not all implementations proceed smoothly; many challenges exist. This chapter thus also identifies these challenges and inhibitors that most enterprises face in mobile ICT adoption and implementations. While the benefits derived from mobile ICT today are substantial, we argue that enterprises can realize a value far greater when transforming over time. A multi-phase transformation framework is introduced. The chapter concludes by summarizing the key findings and identifying key research opportunities.

2.2. Enterprise Mobility Defined

2.2.1. What is Mobility?

There is ample evidence of the significant interest in mobility and the issues related to 'being mobile'. The explosive growth in mobile devices, the emergence and convergence of information and communication technologies (ICTs), and substantial investments in wireless infrastructures are some of the many indicators of a society becoming increasingly mobile (Sarker & Wells, 2003; Gabriel, 2004). A rising interest in the issues surrounding mobility can also be found in the academic community, where the design of mobile information systems, value of mobile applications, use of mobile geographical positioning systems, and the impact of mobile communications are some of the research domains examined (Varshney, 2003).

While the importance of mobility and potential value of 'being mobile' are understood, issues surrounding mobility are still explored without a clear understanding of the concept of mobility itself. In many cases, the term "mobile" is used in place of "wireless" and "portable" as is the case with mobile applications and mobile devices; other frequent uses of the term mobility include "remote", as in mobile office, or "flexible" as in mobile lifestyles (Kakihara & Sorensen, 2001). These examples illustrate the diverse ways that the term is being used today. An understanding of the meaning of mobility, its underlying dimension, and its usage are therefore critical pre-cursors to determining its value in the enterprise context.

In general, the issue of mobility has been studied from two separate viewpoints, namely from a (1) social and (2) technical perspective. The social perspective on mobility concerns itself with the social issues of "movement" and examines the mobility of people, objects, and work in terms of place, space, and time (Kakihara & Sorensen, 2001). Examples of this type of research include geography, urban sociology, and public policy. On the opposite end of the spectrum is the technical perspective of mobility. This stream of research focuses its analyses on the design, use, and functionality of ICT related to mobility. It therefore draws its knowledge primarily from the engineering, computer science, and human-computer interaction disciplines and is driven by the notion of "anytime, anywhere" access to people and information (Perry, O'Hara, Sellen, Harper, & Brown, 2001).

The two-pronged approach to mobility research has thus led to various definitions, beliefs, and usages. The origins of the terms "mobile" and "mobility" come from the

Latin word mōbilis, which generally refers to “move”. Some commonly accepted notions are (MerriamWebster, 2004):

Mobile
1. Capable of movement; movable; not fixed or stationary.
2. Characterized by facility of movement.

Mobility
1. Ability to be moved or to be moved; capacity of change of place.
2. Ability to change quickly or easily; instability, fickleness.

These definitions lead to the conclusion that “mobile” refers to the state where an entity - whether physical, non-physical, tangible or intangible - can move or be moved and “mobility” refers to the ability for achieving it. In addition, (Perry et al., 2001) argues that mobility inherently changes the way entities interact. Similarly, (Kakihara & Sorensen, 2001) propose that human interaction, transformed through “mobility”, should be defined along spatial, temporal, and contextual dimensions, as shown in Figure 4.

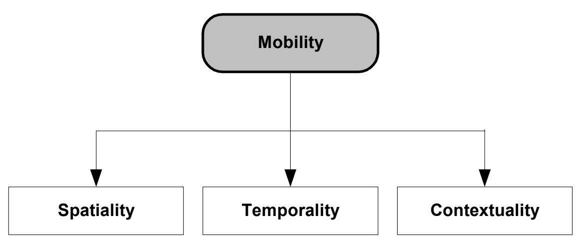


Figure 4. Dimensions of Mobility

Spatiality. Spatiality is the most immediate dimension that comes to mind when discussing mobility (Kakihara & Sorensen, 2001). Most studies related to spatial mobility involve the examination of human behavior in relation to geographical locations. Examples of some of the studies within this domain include the investigation of factors driving human nomadicity, urban growth due to population migration, and the social aspects of transportation, travel, and tourism. More recently, human mobility studies have analyzed the issues surrounding telework and remote business environments.

Mobility, however, is not limited to human movement only; in today's world, a large number of objects are being moved as well. Examples of object mobility include the movement of documents, letters, packages, and freight. Similarly, advances in ICT have led to another form of non-human mobility, often termed information mobility. Information mobility refers to the movement of information, such as television signals, images, sounds, and data via information and communication technologies and infrastructures. The Internet is a good example of a domain in which information travels and moves from one location to another (Shapiro & Varian, 1999).

Information movement on the Internet leads to another separate spatial reality, namely the mobility of space itself (Kakihara & Sorensen, 2001). The computers and networks that connect millions of people are interconnected through a mesh of computers and networks bringing forth a virtual spatiality, which often is called cyberspace or virtual communities (Shapiro & Varian, 1999). The concept of physical location in cyberspace has fundamentally changed, as geographical distances and boundaries have been dissolved.

Temporality. In addition to the "where" aspect, an equally important dimension of mobility includes the identification of the "when", or temporal, aspect of human activity. Some attributes of temporality include the sequence, duration, and recurrence as well as the time allocation of activities (Lee, 1999). With the emergence of new ICT, these attributes have been significantly transformed. (Hammer & Mangurian, 1987) refer to this phenomenon as “time compression”. More specifically they argue that the use of ICT not only accelerates the pace with which human activities are performed, but also enables time savings and allows conducting multiple activities simultaneously and instantaneously. In other words, human activity has shifted from a linear clock-time perspective to one with multiple temporal modes, in which human activities are mobilized from the traditional temporal constraints (Lee, 1999).

Contextuality. While spatiality and temporality have been discussed extensively in a number of research studies, an emerging dimension of mobility is the importance of contextuality (Tarasewich, Nickerson, & Warkentin, 2002). In general, contextuality refers to the situation and environment in which humans perform their activities. More specifically, contextuality provides an understanding in what way and circumstance the activity is being performed. Traditionally, activities were limited to a certain set of contexts. With the emergence of new ICT, however, activities are mobilized from contextual constraints (Perry et al., 2001).

2.2.2. Value-Added Attributes of Mobile ICT

The previous section highlighted the fact that mobility has the ability to break the spatial, temporal, and contextual barriers of traditional computing environments. It is these abilities that distinguish mobility-enabled enterprise solutions from its wired counterpart, such as e-business and e-commerce solutions, in which workers are constrained to space, time, and context. Mobile ICT incorporate these abilities and create several value-added attributes that drive enterprise adoption and development of mobile

ICT, namely accessibility and reachability, connectivity, portability, personalization, localization of products and services, and ubiquity (Junglas & Watson, 2003).

Connectivity. Mobile connectivity is one of the fundamental aspects of mobile ICT. Mobile connectivity refers to the capability of connecting users to machines (U2M), machines to machines (M2M), and users to users (U2U). In comparison to the wired network environment, people and users are not constrained by the location and availability of network plug-ins. Mobile devices enable users to connect easily and quickly to the Internet, intranets, other mobile devices, and databases. There are several modes of connectivity. While the most touted scenario for mobile ICT use is the "always-on" mode, it is more likely that mobile users require only intermittent connection to the network. It is therefore more desirable to have an "always-available" mode of connectivity, rather than an always-on mode.

Accessibility and Reachability. Accessibility and reachability are results of mobile connectivity. A necessary precursor to both accessibility and reachability is that sufficient wireless network coverage is available and that the mobile device is switched on. Reachability builds on the assumption that users and machines have the capability to be in touch and be reached by other entities, while accessibility refers to the capability of access to a wireless network at any place and any time.

Portability. The most unique and distinguishing characteristic of mobile ICT is the ability to physically move computing and communications products and services with the user. Traditional wired computing environments limited users to the location of the device and network plug-in.

Personalization. Personalization refers to the ability to prepare customized information for individual users. For example, a user who is identified as someone that requires hourly updates to inventory levels might be sent specific operational data.

Localization. Localization refers to the ability to locate the geographical position of a user or mobile device. Similar to portability, localization is one of the unique characteristics of mobile ICT. Localization is particularly important when the user requires location-specific information, or the location context itself wants to provide feedback to the user. For example, a user might use the mobile device to find the nearest gas station or ATM. Or, even better, it can be targeted so that users get messages that depend both on where they are and what their preferences are, thus combining localization and personalization (Christensen, 2004).

Ubiquity. The ultimate form of mobility includes the integration of all the aforementioned characteristics. Users have the capability to access the network at any place and any time, and be in touch, be reached, and located at any place and any time using always connected portable devices. Ubiquity therefore exemplifies the ultimate form of spatial, temporal, and contextual mobility (Junglas & Watson, 2003).

In summary, the value of mobility reaches far beyond mere geographical movement of humans; it requires a complete new mindset on human (and object) interaction and should be considered from spatial, temporal, and contextual dimension. Using these conclusions as a basis, it is clear that mobility and ICT enabling mobility offer enterprises a plethora of compelling value propositions. Indeed, many organizations have embraced mobile ICT solutions in a variety of business functions to create an increasingly mobile enterprise. Based on these unique characteristics, what specific benefits have mobile ICT delivered? The following section provides a glimpse into the plethora of benefits and value propositions of mobile ICT.

2.2.3. Benefits and Value Propositions of Mobile ICT

The ability to access the corporate network and resources anywhere and anytime is clearly one of the main benefits and key drivers to adopting mobile enterprise solutions . Field workers are no longer tied to desktop computers to check mission- and task-critical data. The use of mobile ICT enables workers to receive timely answers, which in turn can lead to timely decisions. Enterprise mobility solutions also offer the potential of achieving significant cost savings. Expensive computing equipment can be replaced with smaller, more portable, and less expensive handheld devices. Field workers can use these devices to be immediately connected to all the sources they need. Furthermore, replacing paper-based processes with mobilized applications reduces the potential for errors in transferring information to a call report or clinical chart, leading to a higher level of data accuracy and integrity, which in turn can be harvested for overall business intelligence use. Better access to corporate resources – both data and people – naturally leads to a higher level of productivity, as mobile workers are able to view data that allows them to respond and execute faster to changing market conditions. Figure 5 displays a synopsis of currently realized benefits.

Based on the aforementioned value-added attributes and general benefits, mobile ICT provide enterprises a number of different value propositions. (Perry et al., 2001) found that mobile users valued convenience and efficiency as the main advantages of mobile ICT. (Anckar & D'Incau, 2002) identified cost-savings, flexibility, device familiarity, and the ability to address time-critical, spontaneous, and mobility-related needs as distinct value offerings. Similar statements are made in the popular press where it is suggested that mobile ICT improve operational efficiency and productivity, enhance user communications, and provide higher user flexibility (Heck, 2004).

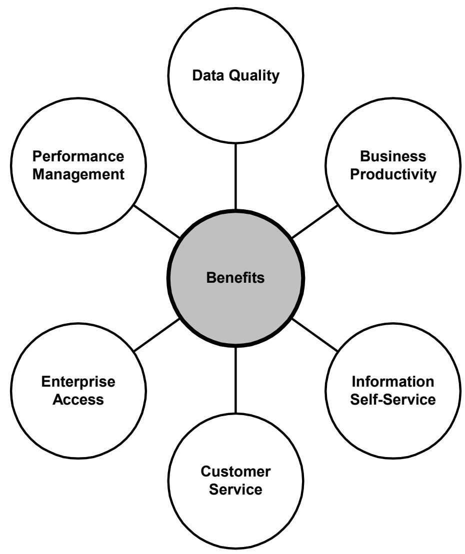


Figure 5. Currently Realized Benefits with Mobile ICT

While the potential benefits are plentiful, they broadly fall into three categories: (1) efficiency, (2) effectiveness, and (3) convenience, as shown in Figure 6.

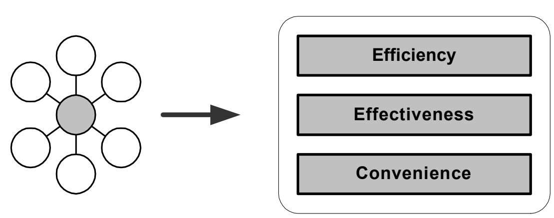


Figure 6. The Three Categories of Mobile ICT Benefits

Efficiency. It is human nature to try to make everyday activities as efficient as possible. With the use of mobile ICT enterprises have a means to utilize work time more efficiently. Users who are away from their desks and on-the-go are capable of having access to information and people from anywhere, raising the overall productivity level. Mobile professionals that travel frequently can utilize their "dead time" at airports or hotels more efficiently by checking, updating, and viewing important corporate information (Kalakota & Robinson, 2001). Fundamentally, mobile ICT change the way people work and interact. In addition to being able to address time-critical and instantaneous needs, mobile ICT also enable enterprises to lower cost expenditures. Using a single device to perform a variety of tasks reduces the overall equipment costs an enterprise often has to bare with traditional wired network environments and computing services (Anckar & D'Incau, 2002). In essence, mobile ICT applied in the right functional areas and deployed to the right users therefore lead to a more agile, adaptive, real-time, and cost-efficient enterprise (Gribbins, Shaw, & Gebauer, 2003).

Effectiveness. An equally significant contribution of mobile ICT is the contribution to task effectiveness. Time-critical and location-sensitive tasks are excellent candidates for mobilization. By providing information at the point-of-action, task effectiveness improves (Tarasewich et al., 2002). In this paper, the author goes one step further and proposes that a higher potential of task and decision-effectiveness is achieved when the right information is delivered to the right place, at the right time and to the point-of-thought.

Convenience. Mobile ICT offer several conveniences. First, it delivers a whole new way of interacting. The convergence of wireless communications and the Internet allows users to interact and communicate via voice, data, or multimedia (Keen & Mackintosh, 2001; Paavilainen, 2001). Users can check their voice mail, send an e-mail or view the latest video conference, all from a mobile device. This leads to the second convenience of mobile ICT. The use of mobile applications often involves the operation of only a single, integrated device. The ability to perform several different tasks with a single device increases a user’s familiarity, proficiency and utilization (Anckar & D'Incau, 2002). While personalization of services has been used extensively in the traditional wired environment, it is an even more important condition in the mobile ICT domain. This is mainly due to the limited screen size and computing capabilities of today’s mobile devices, where personalized and localized information adds significant value to the user (Tarasewich et al., 2002).

The reader should be cautioned that the mere adoption of mobile ICT does not necessarily lead to increased levels of efficiency, effectiveness, and convenience. In fact, there are some tasks that are more suitable than others for enablement through mobile ICT. (Gribbins et al., 2003) argue that mobile ICT implemented in the right enterprise functions and processes, and made available to the right set of users, will provide the greatest value. The implementation of mobile ICT, hence, requires a detailed understanding of which types of tasks, functional areas, and users will benefit from it. In the next section, we explore one of these areas and identify potential enterprise users of mobile ICT.

2.2.4. Categories of Mobile ICT Users

While an understanding of the benefits enterprises can realize with mobile ICT is important, further insight can be gained when examining the needs of the potential target user base. Previous research reports have argued that the primary users of mobile ICT solutions are mobile workers and information users (Zetie, 2005).

Mobile workers are employees whose jobs intrinsically require them to be out of the office and in the field. They range from traditional field service engineers to delivery drivers to government inspectors (Heck, 2004). For these workers, access to information systems, such as real-time task scheduling or emergency response, improves their effectiveness and productivity; but even without such access, they would still need to be in the field. The business case for mobile worker applications typically revolves around readily measurable benefits, including:

- **Productivity**. With access to scheduling systems, service technicians can achieve higher utilization and more efficient routings and can avoid wasted visits when clients cancel or when they don't have necessary parts on the truck.
- **Accuracy**. Data entry and collection at the time when the data is created reduces errors of memory, and replacing paper forms with online systems eliminates transcription errors.
- **Process improvement**. Collecting data in real-time and transmitting it sooner to a back-office system can improve many processes like order shipping. Downstream benefits can be realized in areas like lower inventory and carrying costs; more efficient routing of multi-drop deliveries; and greater customer satisfaction.

Unlike the mobile worker, the information user is more dependent on information than on mobility. Whereas enabling the mobile worker typically focuses on creating specific line-of-business applications relevant to the task at hand, enabling the information user focuses on taking existing information needs and making them mobile. Many enterprises include two distinct patterns of mobile work - with distinct technology and support needs - into this category:

- **Road warriors**. These are the mobile information users who need to be continuously in touch with events at the office, reacting to events regardless of time or place. The core application is always-on push wireless email: Everything else is secondary to the need for communication. They may well boot up their laptops in a hotel at the beginning and the end of the day, but in between, they are rarely separated from their handheld email device. Hard-core road warriors were the first to adopt BlackBerry and the first to sign up for cellular data plans, and they will be the first to pay out for in-flight broadband data access.
- **Roaming users**. These workers need access to all or most of their conventional applications from multiple locations. Armed with a laptop, they need to be able to boot up and securely connect from locations as diverse as hotel rooms, airports, coffee shops, and clients' offices.

Expanding on these two categories of mobile ICT users, the research firm Frost & Sullivan proposed seven "mobility profiles" that can be found in a typical enterprise (Gohring, 2006).

- **People working mainly on site:**
    - Desk workers: work mostly behind their desks (e.g., software designers, operations, accounting).
    - On-site rovers: work mainly at their desks, but sometimes roam in the company (e.g., administrative assistants).
    - Site wanderers: desk-less people who typically spend most of their time roaming on-site (e.g., IT troubleshooter).

- **People working mainly off-site:**
    - Teleworkers: work remotely (from home or from a location away from the office) most of the time.
    - Off-site rovers: work off-site mainly away from their offices, but sometimes at their desks (e.g., consultants).
    - Road warriors: work mainly outside the company (e.g., account executive).
    - Global cruiser: often travel between different company, or customer, locations (e.g., corporate executive).

The mobility profiles for different categories of employees are illustrated in Figure 7, which also shows the approximate amount of time spent by these groups at their desks or elsewhere at other various locations (Zetie, 2005).

	On Site		Off Site	
	At Desk	Elsewhere	At Desk	On the Road
Desk Worker *e.g. Software Designer*	90%	10%		
On-Site Rover *e.g. Admin Assistant*	70%	30%		
Site Wanderer *e.g. IT Troubleshooter*	10%	90%		
Tele Worker *e.g. Remote Agent*			100%	
Off Site Rover *e.g. Consultant*			30%	70%
Road Warrior *e.g. Account Executive*			10%	90%
Global Cruiser *e.g. Corporate Executive*	25%	25%	25%	25%

Figure 7. Mobility Profiles for a Typical Enterprise

Both the mobile worker and the information user groups focus on extending access into the enterprise's systems from the outside. An emerging group of mobile ICT focuses on exactly the opposite: giving the enterprise greater visibility and control from the inside to the external world, in other words creating an "instrumented" enterprise (Zetie, 2005). The potential scope of these types of mobile ICT is tremendous. The number of assets and products that could be monitored and managed exceeds the number of computers and mobile devices significantly. Examples of these types of mobile ICT include (Kornak et al., 2004; Worthen, 2004; Cosgrove, 2005):

- **RFID tags.** Radio frequency identification (RFID) tags can be used to improve the efficiency of supply chain or the reliability of baggage handling at airports. Even pharmaceutical companies are considering "tagging" drugs and apparel makers are "tagging" shirts to reduce counterfeits and illegal distribution.

- **GPS.** Geographical positioning systems (GPS) have already been in use for several years. GPS can be used to monitor vehicle usage and manage fleet maintenance or to track workers' locations and enhance service technician scheduling, as many utility and package delivery companies do (Nah et al., 2005).
- **Wireless Sensor Technologies.** Increasingly, sensor technologies are used to rapidly detect or preempt failures and promptly schedule maintenance, as British Petroleum for example does for its pipeline operations (Brans, 2003).

As mobile usage grows, the three categories (mobile workers, information users, and instrumented enterprise) will no longer be distinct, and their boundaries may begin to overlap (see Figure 8) (Zetie, 2005).

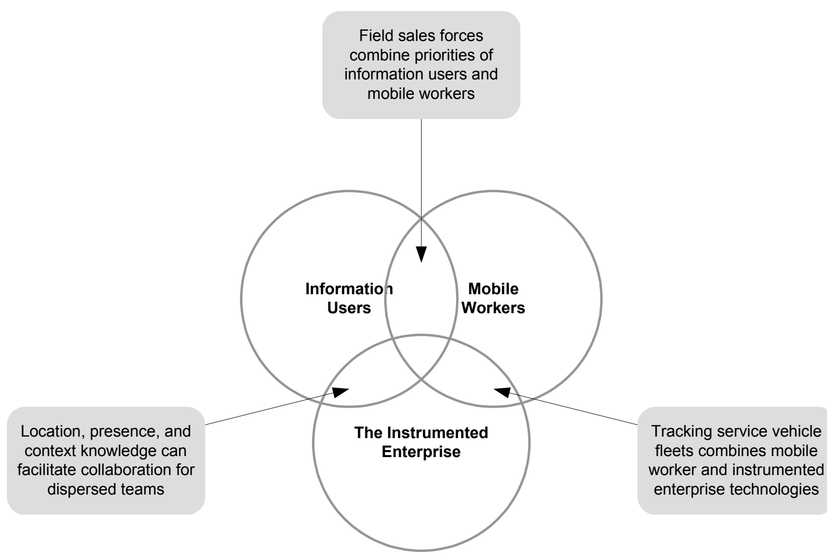


Figure 8. The Interplay between the Three Mobile Constituencies

2.2.5. What is a Mobile Enterprise?

So what constitutes a mobile enterprise? Simply deploying mobile ICT, such as laptops, so employees can perform work in the field or take work home does not constitute a mobile enterprise. Pundits have argued that a slight increase in mobility that a laptop affords amounts to little more than a very small geographic extension of the existing static enterprise (Langley, Sabert, & Timoni, 2000; Gebauer & Shaw, 2004; Varshney, Malloy, Ahluwalia, & Jain, 2004). Similarly, a mobile enterprise is not merely a collection of people with handheld devices, smart phones, tablet PCs, and pagers. Many enterprises already have such workforces, however, it often does not change how those people work with each other and the rest of the organization. Therefore, bolting a group of mobile workers onto an organizational chart does not create a new organization and often does very little to enhance the existing one. However, the more mobile workers an organization has, the greater will be the need to transform at least part of that company into a mobile enterprise. More specifically, it will require a rethinking of how business is organized, how people interact and collaborate, how corporate resources are accessed, and how adaptable an enterprise is (Barnes, 2003; Rouse, 2005a). Building on this notion and the various dimensions of mobility discussed in the previous section, we propose that mobile enterprises exhibit higher levels of access, interaction, and adaptability than their static counterparts do. In visual terms, static enterprises tend to exist in spheres closer to the origin (see Figure 9). The further the sphere is from the origin, the higher the level of enterprise mobility. Thus, independent of location, the mobile enterprise is built on a foundation of processes and technologies allowing full access and instrumented insight to organizational resources, which results in improved adaptability, access, and interaction among employees, customers, partners, and suppliers (Basole, 2005).

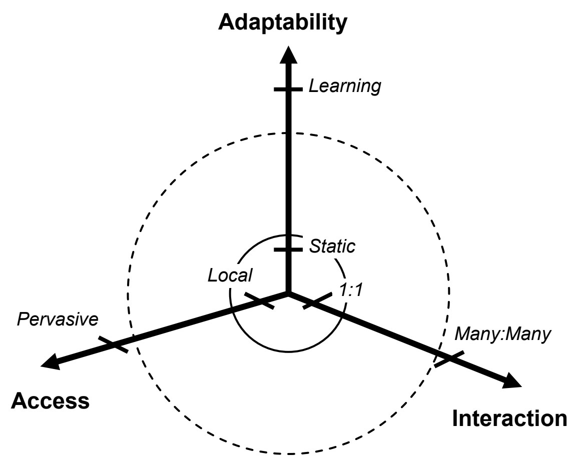


Figure 9. The Dimensions of a Mobile Enterprise

2.3. Mobile ICT Solutions in the Enterprise

2.3.1. Overview

Having a grasp on what constitutes a mobile enterprise, we can now turn our focus to what types of mobile ICT solutions have been deployed. As with most investments in new ICT, it is desirable to leverage the existing technology infrastructure and enterprise applications. Mobile ICT enables enterprises to extend existing enterprise applications to the mobile employee and essentially make enterprise data available anywhere and anytime. In the broadest sense, mobile ICT solutions can be categorized as business-to-commerce (B2C), business-to-employee (B2E), and business-to-business (B2B), as shown in Figure 10.

Mobile B2C applications tend to fall under the m-commerce umbrella, where products and services are offered to consumers using mobile devices. Select examples of current m-commerce applications are the use of mobile wallets to make purchases, the use of mobile coupons for tailored marketing purposes, or mobile banking to check account status (Brans, 2003). However, since the focus of this dissertation is on enterprise adoption of mobile ICT, we do not further discuss the implications of m-commerce as it is outside of the scope of this dissertation. Readers interested in m-commerce applications are referred to (Keen & Mackintosh, 2001; Anckar & D'Incau, 2002; Easton, 2002; Kornak et al., 2004).

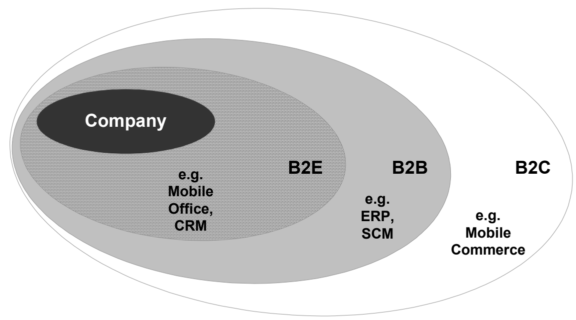


Figure 10. Categories of Mobile ICT Solutions

While the consumer market demand for mobile ICT solutions has seen tremendous growth in various global regions, a growing area of demand is coming from the enterprise side (Lawrence, Culjak, & Injam, 2003). In this section, we focus on mobile B2E and B2B applications; more specifically we highlight what mobile office and enterprise applications have been mobilized and how they help the mobile user today.

2.3.2. Mobile Office

As more work is completed outside the office, the boundaries of the enterprise extend well beyond the desktop. One of the fastest growing and also first mobile enterprise application that has gone mainstream is the mobilization of e-mail, personal information management (PIM) tools, such as calendar and contacts, and schedule management, the wireless Internet, and enterprise portals (Paavilainen, 2001). In fact, many of today's employees expect to have access to e-mail and their PIM data, wherever they are and whenever they need it. The rise of mobile office adoption has increased over the past few years as handheld manufacturers and middleware providers have made significant advancements in delivering and synchronizing e-mails and PIM for mobile device use. Using mobile office applications, employees have instant access to e-mails as soon as it reaches their inbox. Mobile workers are no longer tied to their offices for communication as they can be notified via e-mail, short text messaging, and more recently instant messaging, as soon as new information arrives. Today's mobile professionals, in particular consultants, sales people, and executives, heavily rely on their e-mail capable smart phone or PDA. The explosive growth of Blackberry users is a prime example of the need, and to certain extent "addiction" to have immediate access and the ability to respond to e-mails.

The ability to retrieve, check, and respond to e-mail messages has enabled users to take advantage of down, waiting, or traveling time to catch up on correspondences and become more responsive to both customer and the organization. More recently, major software vendors offer mobilized version of their productivity tools to enable users to create, edit, and view documents and presentations on the go.

Currently, many workers are using mobile devices primarily for email. However, it is important to note that the impetus behind mobile ICT goes far beyond email. Companies are also seeking to connect their workforce to business-critical data and processes. Access to back-end system information, enterprise data and process infrastructure is essential to enabling competitive differentiation, increased productivity and greater efficiency. The most common enterprise applications mobilized today are enterprise resource planning (ERP), customer relationship management (CRM), supply chain management (SCM), and knowledge management (KM). These are highlighted next.

2.3.3. Mobile Enterprise Resource Planning (ERP)

An enterprise resource planning (ERP) solution is an integrated suite of applications that manages an organization's back-office activities, such as finance, manufacturing, purchasing, distribution, and human resources. Due to the relative complexity and size of ERP software solutions as well as varying needs of organizations, they are generally implemented in modules and integrated with, ideally, a single enterprise-wide database in order to minimize duplicate data.

It is clear that the ability to view inventory levels, order parts, perform invoicing, access pricing schemes, and perform order entry – all functions of an ERP solution – is a desirable functionality for mobile users, such as sales and field force personnel. Indeed, most leading ERP vendors offer a mobilized version of commonly used modules today. Using a mobile ERP solution, enterprises provide its sales and field force the ability to view and act upon real-time information such as inventory stock levels and customer orders with their mobile handheld devices regardless of location. A sales representative, for example, visiting a potential customer can monitor the product inventory level and inform the customer immediately if and when the product is available for delivery. Using mobile ERP, sales representatives are also capable of reviewing the history and situation of their customer, arming the sales representative with customer-specific information, and placing orders at the point-of-action.

Another compelling aspect of mobile ERP is the ability for management to have a real-time management reporting, or "dashboard" tool which provides time-critical information about the key performance metrics of the company. As an example, executives of major retail providers know exactly how much inventory they currently have and view the financial performance of that particular store. Extending the concept of a mobile executive dashboard based on ERP data, management and decision makers can then implement an automated alert system to receive instant messages when inventory levels are low, orders are backlogged, or other key performance levels are met or not met.

2.3.4. Mobile Customer Relationship Management (CRM)

Another commonly deployed enterprise application suite is a customer relationship management (CRM) solution. A CRM solution is an integrated set of front-office applications designed to help organizations understand and manage their customers (Kornak et al., 2004). A CRM solution contains a large customer database that includes critical customer data, such as contacts, history, ratings, and personal interests. Using a CRM solution, management and sales force are able to make informed and customized decisions about suitable products and service offerings.

Mobilizing CRM solutions makes intuitive sense, since sales and field force workers often deal with customers directly. Using mobile CRM, mobile professionals have the ability to immediately access all pertinent customer information at the point-of-contact. A mobile CRM solution enables the sales and field force to interact with and provide customers, supplier, and management with real-time information, provide on-site price quotes and take orders, conduct up-selling of products and services, confirm appointments, access and update sales information such as contacts, calendar, and lead management, and simplify and speed up daily reporting of tasks, expenses, and sales records.

Using a mobile CRM solution, sales forces can meet, maintain, and often exceed customer satisfaction by reducing the time it takes to sell and provision new products and services. Response and confirmation time is significantly shortened. A salesperson is able to close deals and place orders at the client site. Overall, order processing is streamlined and optimized for the various needs of the client organization.

While the previous examples largely apply to an organization's sales force, another large group of mobile professionals that can benefit from mobile CRM solutions are mobile field service workers. Paavilainen aptly states that "while traditional voice-based dispatch works in smaller companies, large corporations with a massive number of field workers are able to generate substantial cost savings by implementing mobile data solutions." Field workers receive updated information in the field, are dispatched more intelligently using a combination of GPS and GIS, and can update their work order more rapidly and accurately. Using a mobile CRM solution for field work enables a faster response time, improves the overall dispatching process, streamlines the workflow, increases the efficiency of field workers, enables more accurate and faster billing, leads to less paper work, and less duplicated processes, improve communication, and provides more information and power to "edge" workers.

2.3.5. Mobile Supply Chain Management (SCM)

Many enterprises rely on a tightly integrated and efficient supply chain to provide their products and service offerings. However, uneven demand, need for shorter order-to-shipment times, emergence of new supply designs, and stricter compliance with supplier and customer requirements, requires enterprises to re-engineer their business processes to become more effective, flexible, and efficient. E-business solutions enable enterprises to provide information to stakeholders across the supply chain and reducing potential inefficiencies. Integrating mobile ICT with supply chain management (SCM) applications enables enterprises to further streamline their business processes and shorten lead time. For example, customers often demand greater visibility into the supply chain processes. By incorporating real-time asset tracking through RFID and other wireless solutions, customers gain real-time insight of the status of their order. Mobile ICT in the supply chain also enable enterprises to be more responsive to changing demands and manage warehouses and inventory more effectively (Kalakota & Robinson, 2001). Workers are equipped with wireless handhelds and truck-mounted readers to improve warehouse operations by minimizing inventory risk and out-of-stock situations (Cosgrove, 2005; Nah et al., 2005). For example, when a product comes to a warehouse its barcode can be scanned on the spot. Information such as quantity, product description, origin, and pallet number are immediately captured. Home Depot for example uses a wireless inventory system to ensure adequate levels are available in each store.

Another prime example of the tremendous value of mobile ICT in supply chain management can be found in the transportation and logistics industry. UPS and FedEx are prime examples of how mobile ICT has transformed their operations (Kalakota & Robinson, 2001). Customers can track their packages with real-time information. Lost packages are a thing of the past. A similar application can be found in the airline industry, where electronic bag-tagging is emerging.

The health care supply chain also benefits significantly from the application of mobile ICT. Hospitals can now prepare themselves when certain medical supply inventory levels are running low.

In summary, the use of mobile SCM solutions enables enterprises to gain tremendous visibility into their operations. With the advent and application of RFID in supply chains, this data information insight will grow exponentially.

2.3.6. Mobile Knowledge Management (KM)

A large group of potential users of mobile ICT solutions in the enterprise are information, or knowledge, workers. As such mobile access to a knowledge management (KM) system makes intuitive sense. KM systems enable enterprises to share knowledge across functional boundaries, catalog best practices, and reduce the loss of "corporate" memory (Ward & Peppard, 2002). Since sales people, field and service workers, consultants, and traveling employees all need access to corporate knowledge; mobile KM solutions are an essential element of the mobile enterprise. Using mobile KM solutions, mobile users are able to retrieve documents, collaborate and share information, identify and find experts, advance their knowledge through learning tools, and capture their knowledge, at the place and time they need it. Particularly the ability to capture knowledge at the point-of-action is an important and extremely value aspect to enterprises that have customer-facing employees.

2.4. The Challenges and Inhibitors of Mobilizing the Enterprise

While the list of mobile success stories is growing, there are still several challenges and inhibitors that enterprises face when embarking on their mobilization initiatives. Despite the competitive imperative to be adaptive and flexible, few organizations have successfully integrated mobile ICT without any pain points. Similar to the beginnings of other ICT implementations, such as ERP, many mobile ICT adoptions and deployments have ended in unexpected or undesired results, and often failure (Gohring, 2006). Why is the case?

Previous studies have shown that Mobile ICT implementations generally tend to fail because few technology leaders truly understand that mobile computing is fundamentally different from traditional enterprise computing models (Lyytinen & Yoo, 2002). Mobile ICT is characterized by a lack of consistent bandwidth, limited storage capacity, as well as physically constrained computing devices. In a highly disconnected and variable environment, data synchronization is a complex and thorny problem. Not understanding the complexity of these issues often leads to failure. Other technology-related issues include the maturity of mobile ICT. The industry has certainly progressed tremendously over the past few years, but many issues still remain. Common standards are slowly being established, mobile networks are being upgraded to handle higher data throughput rates; enterprise-level devices capable of handling data applications and providing ease of use are slowly emerging; and compelling mobile enterprise applications with a sound return of investment are appearing on the horizon only now.

Another major inhibitor to widespread adoption of mobile ICT solutions is the issue of security. Mobile data and devices are exposed to a number of security threats. How do you ensure that mobile data is securely transmitted? What encryption standards need to be in place? How do you keep mobile data and devices from being stolen? How do you ensure that the right person is using the mobile device? What happens if mobile devices are infected with viruses and what threat does it represent for the entire enterprise?

Indeed, security has been cited as a major deterrent to adoption of mobile ICT by many leading ICT decision makers (Cosgrove, 2005).

While it is easy to call technology challenges and inhibitors as the primary category for non-adoption and implementation of mobile ICT, they are certainly the easiest to address. In fact, the most complicated issues are related to managerial, strategic and organizational factors (Hamel & Prahalad, 1990; Venkatramam, 1994; Melville, Kraemer, & Gurbaxani, 2004). Lack of management awareness is a key inhibitor to mobile ICT adoption. As with most new ICT, top management vision, support, and execution are required to ensure the success of implementations. Alignment with strategic goals and a clear business case are also commonly cited as discerning factors in the mobile ICT adoption process. It is clear that enterprise mobility requires a huge cultural change for leadership, managers, and users. When looking at mobility, it is easy to start off in the technology space, focusing primarily on hardware issues while overlooking equally meaningful business areas such as human resources, facilities, and legal. The supporting organizational layer is critical to the success of mobility initiatives because the office paradigm of a highly structured business environment does not always translate smoothly into a mobile world.

Addressing these challenges and inhibitors in a comprehensive manner is therefore a key step in ensuring successful mobile ICT initiatives.

2.5. Enterprise Transformation via Mobile ICT

Mobilizing enterprise applications and providing business professionals access to data and information anywhere and anytime is clearly an important first step in gaining business value (Barnes, 2003; Kornak et al., 2004); however these gains are only the beginning. We argue that enterprises can realize a much broader range of benefits over time by pursuing a multi-stage transformation process enabled by mobile ICT. Research has shown that ICT in general have the ability to change and fundamentally transform enterprises in a number of ways (McKeown & Philip, 2003; Chan & Hoang, 2005; Basole & DeMillo, 2006; Rouse, 2006). This transformational impact can be experienced and realized at strategic, operational and organizational culture levels (Taylor & McAdam, 2004). Drawing on this literature, we argue that the impact of mobile ICT is indeed far beyond mere business process improvements and enhancements (Davidson, 1999; Kornak et al., 2004; Basole, 2005).

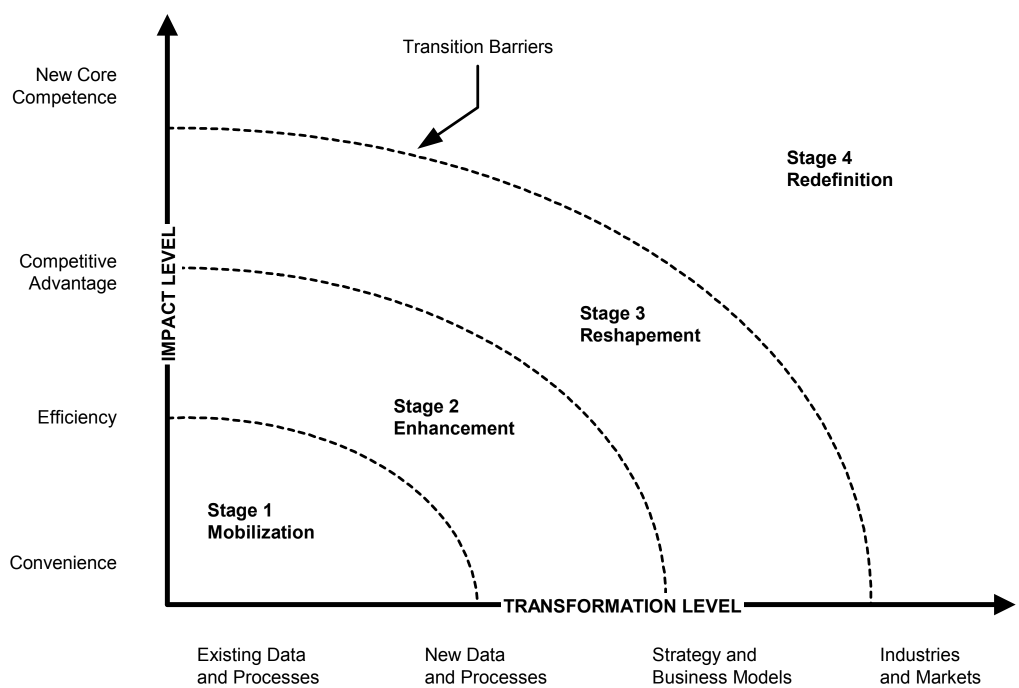


Figure 11. Conceptual Framework of Enterprise Transformation via Mobile ICT

Extending previous work, four distinct stages of enterprise transformation via mobile ICT are proposed. The conceptual framework is shown in Figure 11. The subsequent sections describe each of the four stages in further details

2.5.1. Mobilization (Stage 1)

The first stage of the transformation process begins with the mobilization of existing data and applications. Mobilization refers to the process of making current business data, processes, and applications available for use on mobile/wireless devices (Britton, Case, Citron, Floyd, Li, Seekamp, Topol, & Tracey, 2001). The first stage aims to provide end-users with a new level of convenience by enabling access to resources anywhere and anytime. Examples include access to corporate e-mail, the Intranet, and other data and human resources. Generally, stage 1 solutions will lead to higher levels of convenience and generate significant performance gains in productivity, speed, efficiency, quality, and customer service (Kornak et al., 2004).

2.5.2. Enhancement (Stage 2)

The second stage shifts its focus from mobilizing existing data and applications to enhancing existing and creating new business processes that leverage the unique functionalities and capabilities of mobile ICT (Barnes, 2003). Characteristics of these business processes generally include two elements, namely (1) mobility (do it anywhere) and (2) immediacy (do it now), all with the user's context in mind. While solutions in the enhancement stage may affect working practices and modify business processes, they seldom change the business in a fundamental manner. This level of transformation occurs in Stage 3 of the mobile transformation process.

2.5.3. Reshapement (Stage 3)

As enterprises transition to stage 3, mobile ICT begin to reshape business models and strategies. The creation of innovative new mobile processes and services provide enterprises with a source of competitive advantage. In this stage, mobile ICT often enable a business capability and become a critical element in the overall business model. For example, wireless sensors could enable a pharmaceutical company to shift from selling only medication to a business model in which the company provides both medication and sensors, and enters into a contract with a medical practitioner to perform continuous monitoring and keep a patient's blood pressure within an agreed range.

2.5.4. Redefinition (Stage 4)

In the fourth and final stage of the transformation process, mobile ICT create entirely new core enterprise competencies. Business models and strategies are based and revolve around enterprise mobility and in turn lead to a redefinition of entire markets and industries. Concrete examples for this stage of the mobile transformation process have not emerged yet, however, as enterprises continue to embrace mobility and mobile ICT mature, mobile redefinition is expected to become an increasingly common business phenomenon.

The four stages of mobile enterprise transformation are not purely sequential. Activities performed during Stage 1 continue during Stages 2-4. Some companies may elect transitioning directly from Stage 1 to Stage 3. New ventures may begin their business models based on Stage 2 philosophies. Stage 4 examples are still scarce, but are poised to emerge as mobile ICT continue to mature and new business models take shape. Yet, all four stages are inextricably linked in significant ways. Diligent pursuit of Stage 1 initiatives will lead to many Stage 2 and 3 opportunities. Similarly, Stage 4 opportunities will emerge as enterprises realize the full transformational potential of mobile ICT solutions.

2.5.5. Adoption and Transition Barriers

Enterprises that undergo significant organizational changes generally encounter a number of transition barriers. Empirical evidence suggests that these barriers can be broadly categorized as economic/strategic, technological, organizational, technological, and environmental-related issues (Taylor & McAdam, 2004).

Despite tremendous advances, mobile ICT are still in their infancy stage. Evolving standards, lack of technology maturity, and issues of compatibility with existing systems and infrastructure are causing organizations to delay mobile ICT implementation (Basole, 2005). Another prevalent barrier is related to the ongoing debate of business value and cost. Investments in emerging technologies such as mobile ICT often require significant financial commitments by the enterprise. With shrinking IT budgets, it becomes critical to understand what value enterprise mobility can deliver now, and in the future. Mobile ICT implementations must thus be aligned with the overall business strategy and support enterprises' current and future business objectives. Similarly, the availability of other organizational resources – such as human and technical support – must be in place in order to successfully adopt mobile ICT and transition across the stages. From an organizational perspective, enterprise culture, size and structure also play a critical role in the adoption and transition process. As with most new ICT implementations, end-users often show resistance to new processes and change. Mobile ICT will have a radical, and potentially transformational, impact on the way work is done; hence, particular attention to end-user needs, education, motivation and incentives must be provided to ensure a successful adoption, implementation, and transition. Lastly, unfavorable market conditions, strong regulatory influences, lack of customer and supplier pressure, and inadequate vendor support may also inhibit organizational adoption of mobile ICT.

In summary, in order to avoid a "fragmented" mobile ICT adoption and transformation, enterprises should determine the fit between the value of mobile ICT and the overall business strategy, and ensure that a common vision, leadership support, and strategic path for implementing enterprise mobility solutions is in place (Ward & Peppard, 2002).

2.5.6. Illustrative Examples

Just as every enterprise is unique, so is every industry. Empowered by customized mobile business solutions, enterprises have the ability to address the unique challenges of their respective industries. In recent years, the number of successful mobile ICT implementations has grown significantly. Table 1 highlights several industry examples of current mobile ICT solutions in the enterprise. Clearly, this review is not exhaustive; rather it serves as a starting point to understanding why enterprises decided to implement mobile ICT, how mobile ICT are used, where mobile ICT are deployed, and what the transformative impact has been.

Table 1. Examples of Mobile ICT Adoption and Transformations

Example	Phase	Extent of Adoption and Transformative Impact
Hilton Hotels	1	Many hotel chains, including Hilton Hotels, have implemented wireless check-in processes, enabling the customer to bypass the often relatively inconvenient in-person check-in process. In some Hilton Hotels, a sensor device near the front desk registers the traveler's arrival and sends a message to his cell phone. The traveler bypasses the check-in counter, glances at his mobile device, and enters a PIN. The mobile device screen shows his room number, and he heads for the room. Hilton has also partially implemented curbside check-in. In this scenario, the traveler is greeted by uniformed hotel service agents who can perform the check-in right there when the traveler arrives, using a handheld unit that is tied to the hotel reservation system. In both cases, the time it takes to move through the check-in process is significantly reduced. The handheld device provides access to a mobilized version of existing reservation and CRM systems enabling a more effective and tailored customer service and a means of customer self-service, and improves overall customer convenience and satisfaction.
U.S. Census Bureau	1	The U.S. Census Bureau has recently acquired 500,000 smart phones. Using smart phones, the U.S. Census Bureau will be able to more effectively collect census data, reduce data entry errors thus improving the overall data quality. This initiative is primarily geared to mobilize existing data collection processes and improve the convenience and efficiency of their collection field personnel.
JetBlue Airways	1	JetBlue has mobilized many of their critical operational processes. For example, JetBlue's focus on low costs and efficiency drove the in-house development of an event management system to track all safety-related incidents in the company which can be accessed by mobile devices. The decision to use BlackBerry wireless devices to report and respond to irregular operations—anything from weather delays to a passenger injured by his own briefcase when he opened the overhead bin – enables JetBlue to quickly respond to customer and operation critical situations, providing a higher level of customer service and effectiveness. JetBlue also provides its customers with the ability to wirelessly check-in at curbside, increasing passenger throughput through the check-in process and providing greater convenience. Any flight updates and changes are also automatically sent to the mobile device.
Stanford Hospital and Clinics	1	As medical records go electronic, hospitals are finding that wireless networks can get the records to where the doctors and nurses want to use and need them the most. A case in example is Stanford Hospital and Clinics. With wireless and mobile systems, health care professionals at Stanford Hospital can spend more time with the patient and less time to take down notes and check medical supply inventories. Mobile devices at Stanford Hospital enable staff to access and update records and make orders at the point of care. It reduces errors and delays, and tends to fit into the doctors' and nurses' workflow. The mobilization of electronic medical record systems thus enables the prevention of errors, enforce standards, make staff more efficient, simplify record keeping and improve overall patient care.
Hertz	1	Hertz has equipped its Hertz airport Courtesy Bus drivers with wireless handheld computers. The computers allow Hertz Courtesy Bus drivers to alert personnel at the check-in booth that the customer is en route, instantly transmitting customer arrival data over the wireless network. Upon boarding the stopped Hertz Courtesy Bus, customers simply give their name to the Courtesy Bus driver, who confirms the reservation on a mobile handheld device. The computer communicates with Hertz' host system to authenticate the traveler, arrange for the correct vehicle, and finalize the rental process. When the customer arrives at the Hertz rental facility, the car is ready and waiting, even if the customer missed his or her original flight and arrives late. Furthermore, this real-time process allows the driver to deliver customers directly to their rental vehicles, saving them time and the aggravation of handling their luggage through a traditional check-in process.

Table 1. (continued)

Example	Phase	Extent of Adoption and Transformative Impact
Accenture	1	As most professional services firms, Accenture has provided its frequently traveling consultants with mobile handheld devices with which they can continuously check their e-mail, calendar and contact information, and access office applications as needed. Since consultants are often in transit at airports, consultants can take advantage of their down or waiting time, increase their productivity and keep up-to-date with changing schedules.
Georgia Tech Parking Office	1	The Georgia Tech Parking Office has equipped its parking enforcement staff with a mobile handheld device that can issue and print out citations on the spot. This has eliminated the need to manually update the parking citation system as information is wirelessly transmitted and updated in real-time. In mobilizing the field staff, the quality of data has improved, errors are reduced, and the efficiency and productivity of the field personally has been increased.
Cox Communications	2	Cox Communications, a full-service telecommunication company, employs a large number of service technicians that can benefit from having customer critical data available in the field. In order to achieve this objective, Cox Communication provides secure mobile broadband access to its LAN applications via mobile handheld devices in every truck and van. Using a mobile management approach, Cox can update software running on mobile devices wirelessly and distribute critical business information to mobile service technicians, creating a "paperless workforce." By mobilizing workforce automation and office applications, Cox Communications provides their technicians with a real-time access to service call data, allows for intelligent dispatch, inventory management, and work order scheduling. Having access to customer data, makes service technicians more informed and efficient, leading to significant cost reductions and ultimately providing better customer service. Using mobile ICT allows Cox field personnel to improve response times and ultimately optimize resource use. A natural extension of their mobile ICT solution includes the implementation of advanced mobile CRM functionalities to up and cross-sell additional services, provide mobile point-of-sales, and leverage the data obtained through mobile business intelligence solutions. The mobilization of existing workflows and creation of new processes has enabled Cox to become increasingly efficient and effective, and provide significant improvements in customer service. Indeed, mobile ICT has become a central competency of Cox Communications.
FedEx	2	The logistics industry is one of the first to have embraced and implemented mobile ICT solutions in their operations. A prominent example is FedEx. FedEx uses mobile handheld devices throughout their package delivery processes; as packages move through various delivery stages, the barcode is scanned and the information is updated in real-time in the FedEx information systems. Customers have a very high level of visibility of where the package is at any time, increasing the level of customer convenience and trust. As packages are sorted and/or moved between operational points, updates are sent automatically to the central system as they are scanned using handheld scanners. Drivers use mobile devices when delivering packages, enabling customers to sign off on the spot and thus updating the delivery information system with additional value-added data. Mobile ICT are a central aspect of FedEx's operations and have transformed they way information is collected and work processes are designed. It has moved beyond mobilization of existing processes but created entirely new work processes, leading to a higher level of operational effectiveness and efficiency.

Table 1. (continued)

Example	Phase	Extent of Adoption and Transformative Impact
Bayer	2	Sales people at pharmaceutical companies generally do not actually sell products. Instead, these mobile workers, often called medical representatives tend to have the responsibility to promote drugs by informing doctors with the latest pharmaceutical details or medical evidence. They also collect feedback on their products about efficacy, safety, and quality, as is required by most pharmaceutical companies. An illustrative example of mobile ICT deployed in the pharmaceutical industry, is Bayer Healthcare. Bayer's goal was to enable its medical representatives to enter call and other customer information at the point-of-visit, to reduce the reporting time and generally improve the quality of information reported. Bayer envisioned to use this information for specific customer analysis, and to improve its marketing, logistics, and manufacturing efforts. Since medical representatives are legally obliged to visit doctors no more than eight times within a half-year period after a new drug is released to review its safety with doctors, capturing essential information in this limited timeframe in the field is essential. In order to address these issues, Bayer decided to mobilize their Siebel customer relationship management application and make it available to their medical representatives on wirelessly enabled personal digital assistants (PDAs). This improved the medical representatives' sales effectiveness since it enabled them to enter details about each visit on their PDAs and have access to critical company and medical information. Providing access to corporate information helped medical representatives share salient information with doctors and gather better data for information analysis. It also resulted to an improved tracking of frequency of calls with doctors, which led to an overall improvement in regulatory compliance.

2.6. Summary and Research Opportunities

The emergence of mobile ICT within the enterprise has resulted in a paradigm shift in productivity because of the way in which business professionals can remain as productive outside the office as they are within the office. Undoubtedly, the mobilization of employees, applications and information can enhance productivity significantly. Mobility means freedom and flexibility in the ways in which an enterprise can conduct its business, giving its employees access to critical information wherever and whenever they need it.

This chapter provided a comprehensive view on the value, benefits, and impact of mobile ICT, and illustrated current application areas of mobile ICT. This chapter also argued that mobilizing existing enterprise applications are only the beginning and that enterprises can realize a value far beyond the ones experienced today. Our discussion of mobile ICT as the context sets the stage for numerous theoretical research opportunities. Previous research has shown that strategic planning for new ICT adoption and implementation encompasses a number of challenges (Ward & Peppard, 2002). These generally fall into three broad categories, namely technical, organizational, and economic issues. Technical issues include the assessment of current IT assets, evaluation of technology options, and integration into existing processes (Cooper & Zmud, 1990a). Organizational challenges include the change in organizational culture and structure, and development of new alliances and partnerships (Decanio, Dibble, & Amir-Atefi, 2000). Examples of economic issues are justification of large technology investments, risk assessment of emerging technologies, and management of current IT assets. Each of these issues is often considered as part of an overarching enterprise technology transformation process (Rouse, 2006). The multitude of different criteria illustrates the complexity of ICT adoption and implementation decisions. The complexity is further amplified when the technology is only starting to emerge as its value is often poorly understood. This is clearly the case with mobile ICT.

The emergence and growing enterprise interest of mobile ICT thus brings a wealth of interesting new research opportunities with it. While practitioners are aware of the potential value mobile ICT can provide to enterprises, only little theoretical research has been done to provide insight into why and how exactly enterprises adopt mobile ICT, what strategies succeed, how organizations can prepare themselves for enterprise mobility, and in what ways mobile ICT will transform them.

So what drives enterprise adoption of mobile ICT? An investigation of existing literature of ICT adoption will provide a starting point for the determinants of mobile ICT adoption. Similarly, the identification of inhibitors can provide insight to why enterprises elect not to adopt mobile ICT.

Another critical element of the cost/benefit equation is to examine whether an enterprise is ready to adopt mobile ICT. Most organizational readiness studies have focused on technological and financial resources. Does mobile ICT require the availability of other organizational resources and capabilities?

Lastly, all of the aforementioned issues have to be considered as part of the overall mobile ICT adoption and implementation strategy. How can organizations align their business strategies to successfully adopt, implement and infuse mobile ICT?

While this dissertation does not address all of these questions, they are important to keep in mind when investigating mobile ICT adoption and implementation decisions. In the following chapters, we provide an in-depth analysis of existing research and review some of the most important models, frameworks, and theories in the ICT adoption domain. In doing so, we provide further insight to emerging ICT adoption and provide an initial step to address the aforementioned issues for future research.

CHAPTER 3:

THEORETICAL BACKGROUND

3.1. Introduction

The study of enterprise adoption of ICT has been a topic of interest to researchers from a wide range of disciplines over the past three decades (Daft, 1978; Tornatzky & Klein, 1982; Fichman, 1992; Gallivan, 2001). The cross-disciplinary nature of the topic has led researchers to draw on theories and models from areas such as economics, computer science, psychology, and management (Dewar & Dutton, 1986; Attewell, 1992; Loch & Huberman, 1999; Kambil, Kamis, Koufaris, & Henry C. Lucas, 2000; Bethuyne, 2002; Zhu & Weyant, 2003). Because of this, enterprise adoption research has become a rich tapestry of theoretical and conceptual foundations.

Despite the substantial number of enterprise adoption studies and reviews conducted across numerous disciplines, researchers argue that results are inconsistent due to the complex and context-sensitive nature of the phenomenon itself (Damanpour, 1991; Gallivan, 2001; Fichman, 2004). Enterprise adoption of ICT cannot be understood without careful attention to individual, organizational, technological, and environmental contexts in which it takes place (Tornatzky & Klein, 1982; Boynton & Zmud, 1987; Damanpour, 1991; Frambach, 1993; Chandrashekaran & Sinha, 1995).

Thus, the objective of this chapter is not to suggest new theories or propositions concerning enterprise adoption of ICT as there is no lack of these. Given the vast nature of the innovation literature, there is also no attempt made to offer a comprehensive recitation of research findings or methodologies. The purpose is, rather, to provide a sufficient understanding of the current state of enterprise adoption research. In order to do so, this chapter first provides a comprehensive review of the scholarly development of the literature by examining articles on enterprise adoption of ICT in leading journals, conference proceedings, and book chapters.[1] This is followed by a review of some key theoretical research streams that describe the determinants, processes, and context of enterprise adoption of ICT. Based on the findings of the literature analysis and theory review, the chapter concludes by suggesting several important implications for theory and practice.

3.2. Enterprise Adoption of ICT: A Research Synthesis

3.2.1. Overview

Understanding enterprise adoption of information and communication technologies (ICT) is the focus of a large and growing body of research in a variety of complementary academic disciplines (Norton & Bass, 1987; Raho, Belohlav, & Fiedler, 1987; Attewell, 1992; Premkumar, 2003). The first studies on enterprise adoption were nascent to the marketing and information systems community (Czepiel, 1974; King, 1978; Keen, 1981; Kimberly & Evanisko, 1981; Tornatzky & Klein, 1982). This research primarily focused its efforts on exploring the determinants and inhibitors and understanding the underlying processes that drove enterprise adoption of ICT. As ICT continued to infuse rapidly in organizations, economic and managerial issues emerged (Damanpour & Evan, 1984; Meyer & Goes, 1988; Abrahamson, 1991; Gordon & Gordon, 1992; Damanpour & Gopalakrishnan, 2001; Abraham, 2002; Jevaraj, Rottman, & Lacity, 2004; Joo & Kim, 2004; Mustonen-Ollila & Lyytinen, 2004). Researchers in the management and economics literature thus explored the strategic issues of enterprise adoption of ICT

[1] References for the studies cited in this research synthesis can be found in Appendix A.

(Mamer & McCardle, 1987; Cooper & Zmud, 1990b; Itami & Numagami, 1992; Majumdar & Venkataraman, 1998). Some common topics of interest were how leadership could facilitate the adoption process, how organizations could value ICT, and what impact contextual influences, such as the competitive environment, regulatory forces, supplier pressure, and social networks, would have on the level and extent of enterprise adoption of ICT (Keen, 1981; Damanpour & Evan, 1984; Premkumar & Ramamurthy, 1995; Ravichandran, 2000; Png, Tan, & Wee, 2001; Saban, 2001; Scott & Vessey, 2002; Zhu & Weyant, 2003; Huisman & Kort, 2004; Kauffman & Li, 2005). More recently, studies in the innovation, decision sciences, and technology and engineering management literature have used a variety of analytical modeling approaches to mitigate risks associated with enterprise adoption of ICT and determine optimal adoption strategies (Dutta, 2001; Amiri, 2002; Luque, 2002; Udo & Kirs, 2002).

While enterprise adoption research has received attention in a wide range of disciplines, most studies have used a single-discipline lens approach (Gallivan, 2001). Only few studies have integrated theories, concepts, and methodologies from different disciplines (Kwon & Zmud, 1987; Meyer & Goes, 1988; Frambach, 1993; Gallivan, 2001). This is surprising due to the inherently cross-disciplinary nature and importance of enterprise adoption of ICT to executives, managers, economists, marketers, and ICT users.

The objectives of this section are to provide a comprehensive picture of the scholarly development of enterprise adoption research by analyzing the literature and presenting a classification scheme. Drawing on an examination of leading journals, conference proceedings, and book chapters in multiple disciplines, over 350 relevant studies were identified. The results show that enterprise adoption research has indeed experienced a steady growth over the last three decades and has surged tremendously over the past five years. Results also indicate that studies appear in a diverse range of disciplines, but predominantly in the Information Systems area. Studies are classified and results of these are presented, based on a scheme that consists of four main categories: functional discipline, publication, research methodology, and ICT type.

3.3.2. Research Methodology

Research on enterprise adoption of ICT is not confined to a single discipline. As such, the identification of relevant studies becomes quite cumbersome and requires a holistic analysis approach. A preliminary scan of the literature revealed several complementary research streams that examined enterprise adoption of ICT. In order to simplify the classification of the relevant literature the research streams were consolidated and grouped into the six categories (see Table 2).

In order to capture the growing base of studies across these numerous areas, an extensive search of the literature was conducted by searching the following online databases ABI/INFORM database, Academic Search Elite, ACM Digital Library, Emerald Fulltext, IEEE Xplore, Science Direct.

Table 2. Discipline Categories

Category	Disciplines
I	Information Systems and Information Technology
II	Decision Sciences, Technology Management & Operations Management
III	Management, Strategy, and Organizational Behavior
IV	Innovation
V	Marketing
VI	Economics and Public Policy

Most of these databases provide online access to the top information systems, management, marketing, strategy, technology management, engineering, economics, public policy, and innovation journals. In cases where online access was not available, a hardcopy of the article was obtained through the Georgia Tech library or Interlibrary Loan System (ILL).

The literature search was based on a number of different descriptors adapted from the Barki keyword classification scheme, which is commonly used to classify studies in the management information systems (MIS) and technology management literature . These descriptors included: "technology adoption", "organizational adoption", "implementation", "diffusion", "innovation", "technology planning" and "technology strategy." A search of references in several textbooks and conference proceedings on enterprise adoption topics was also conducted.

The starting date of the review was 1974, as this was the first occurrence of an article or study published on enterprise adoption of ICT to the best of our knowledge. The full text of each article was reviewed to eliminate those articles that were not actually related to enterprise adoption. The selection criteria for article inclusion were as follows:

- Adoption studies focused solely on enterprise adoption with the organization or firm as the unit of analysis were selected. This eliminated a substantial body of research that focused on individual, or end-user, and group adoption.
- Only those articles that had been published in the six functional categories (see Table 2) and associated leading journals and conference proceedings (see Table 3) were selected, as these were the most likely outlets for enterprise adoption research.

- Only those articles based on rigorous research methods were included.
- Doctoral dissertations and working papers were excluded.

The search yielded 365 studies from 78 journals, 6 conferences, and several textbooks.

<u>3.2.3. Classification Method</u>

Each of the 365 articles was reviewed and classified according to categories suggested by previous studies (Meyer & Goes, 1988; Fichman, 1992; Swanson, 1994; Gopalakrishnan & Damanpour, 1997; Gallivan, 2001). The articles were classified according to:

(1) Year of publication
(2) Functional discipline
(3) Publication
(4) Research Methodology (Conceptual, Theory, Case study, Survey, Field study, Economic modeling, Mathematical modeling, Simulation, and Archival research).
(5) ICT Type (General IS/IT, Enterprise IS, E-Business/E-Commerce, Networking & Communications, Data Management, Emerging ICT).

Table 3. Journals Included in Research Synthesis by Area

Category	Journal	Year
I	Behavior and IT	1996-2005
	Communications of the ACM	1958-2005
	Communications of the AIS	1999-2005
	Computer Networks and ISDN Systems	1995-1998
	Decision Support Systems	1995-2005
	Electronic Commerce Research	2001-2005
	Electronic Journal of Information Systems Evaluation	1997-2005
	Electronic Markets	1999-2004
	European Journal of Information Systems	1997-2005
	Information and Management	1986-2005
	Information Systems Frontiers	1999-2005
	Information Systems Journal	1998-2005
	Information Systems Management	1990-2005
	Information Systems Research	1990-2004
	Int'l Journal of E-Commerce	1996-2004
	Int'l Journal of Human-Computer Interaction	1997-2004
	Journal of Computer Information Systems	2000-2004
	Journal of Electronic Commerce Research	2000-2005
	Journal of Global Information Management	1999-2004
	Journal of Information Systems	1986-2004
	Journal of Information Technology	1986-2005
	Journal of IT Theory and Application	1999-2004
	Journal of Management Information Systems	1984-2005
	Journal of Org. Computing & E-Commerce	1991-2005
	Journal of Strategic IS	1995-2005
	Journal of the AIS	2000-2004
	MIS Quarterly	1977-2005
	SIGMIS Data Base	1995-2005
II	Decision Sciences	1975-2005
	European Journal of Operational Research	1995-2004
	IEEE Transactions on Engineering Mgmt	1982-2005
	Information Knowledge Systems Mgmt.	1999-2004
	Information Resources Management Journal	1990-2004
	Int’l Journal of Internet and Enterprise Mgmt	2000-2004
	Int’l Journal of Production Research	1997-2005
	Interfaces	1990-2005
	Journal of Purchasing & Supply Chain Mgmt	2000-2004
	Management Science	1975-2005
	OMEGA	1995-2004
	Production & Operations Management	1997-2004

Table 3 . (continued)

Category	Journal	Year
III	Academy of Management Journal	1996-2005
	Academy of Management Review	1976-2005
	Administrative Science Quarterly	1956-2005
	Journal of Business Research	1995-2004
	Journal of Business Strategy	1980-2004
	Journal of General Management	1997-2005
	Journal of Management	1985-2004
	Journal of Management Studies	1980-2005
	Organization Science	1990-2004
	Sloan Management Review	1980-2005
	Strategic Management Journal	1980-2005
IV	European Journal of Innovation Management	1998-2005
	Int'l Journal of Innovation Mgmt	1999-2005
	Journal of Product Innovation Management	1995-2004
V	European Journal of Marketing	1990-2004
	Industrial Marketing Management	1990-2004
	Journal of Marketing	1970-2005
	Journal of Marketing Management	1990-2004
	Journal of Marketing Research	1970-2005
	Journal of the Academy of Marketing Science	1995-2004
	Marketing Letters	1997-2004
VI	American Economic Review	1911-2004
	Applied Economics	1969-2004
	Economics of Innovation & New Technology	2000-2004
	Int'l Journal of the Economics of Business	1995-2004
	Journal of Economic Dynamics & Control	2000-2004
	Journal of Economics	1970-2004
	Journal of Industrial Economics	1964-2003
	RAND Journal of Economics	1970-2004
	Research Policy	1980-2005
	Review of Industrial Organization	1997-2005
	Structural Change & Economic Dynamics	2000-2004
	Telecommunications Policy	1988-2004
	World Economy	2000-2004
	Others[2]	

[2] Others include articles from conference proceedings (Americas Conference on Information Systems, Diffusion of Innovation Group in Information Technology Conference, Hawaii International Conference on System Sciences, International Conference on Information Systems, Annual Meeting of the Decision Sciences Institute, and Conference of the Academy of Management), non-classifiable journals (Communication Theory, Int'l Journal of Medical Informatics, Journal of Construction Engineering & Mgmt, Journal of Medical Systems) and books/book chapters.

3.2.4. Classification by Year of Publication

The distribution of articles published by year is shown in Figure 12. It clearly indicates that research on enterprise adoption of ICT was relatively low prior to 1997 and has significantly increased in the last five years (2001-2005).

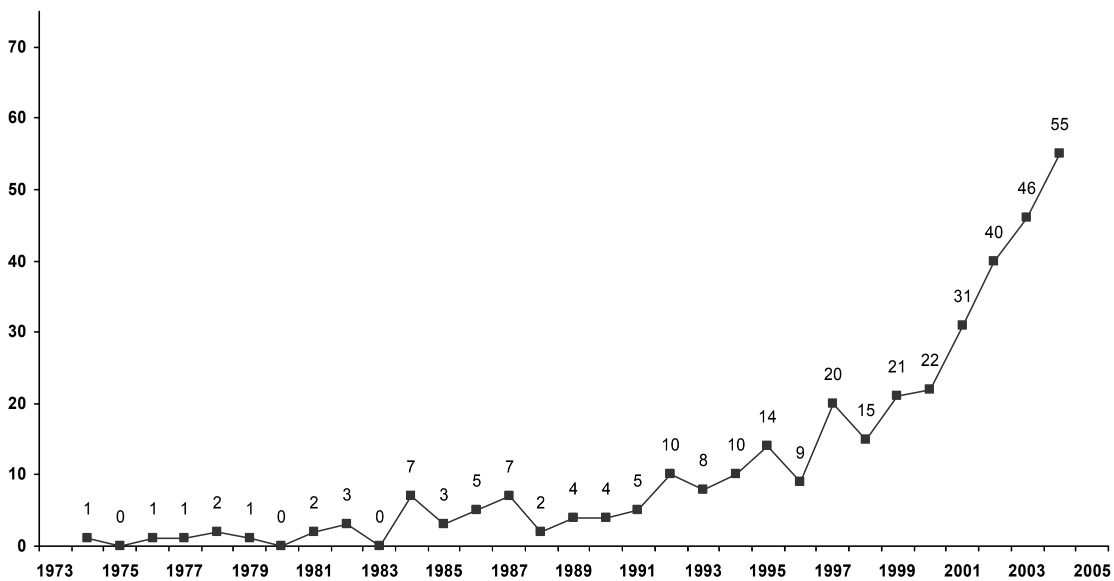


Figure 12. Overall Distribution Trend of Publications

3.2.5. Classification by Functional Discipline

A classification by functional discipline shows that Category I (Information Systems and Information Technology) studies constitute an overwhelmingly large percentage (49.3% / 180 studies) of all research on enterprise adoption, as indicated in Table 4. The second largest portion of enterprise adoption research comes from Category II (Decision Sciences, Technology and Operations Management) with 15.9% (58 studies).

Table 4. Distribution of Articles by Year of Publication and Functional Discipline

Area	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Information Systems and Information Technology	0	0	0	1	1	0	0	1	1	0	4	3
Decision Sciences, Technology Mgmt, & Operations Mgmt	0	0	0	0	0	1	0	0	2	0	0	0
Management, Organizational Behavior, and Strategy	0	0	1	0	1	0	0	1	0	0	2	0
Innovation	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	1	0	0	0	0	0	0	0	0	0	0	0
Economics and Public Policy	0	0	0	0	0	0	0	0	0	0	1	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
Yearly Total	**1**	**0**	**1**	**1**	**2**	**1**	**0**	**2**	**3**	**0**	**7**	**3**
Percent of Total	**0.3%**	**0.0%**	**0.3%**	**0.3%**	**0.5%**	**0.3%**	**0.0%**	**0.5%**	**0.8%**	**0.0%**	**1.9%**	**0.8%**
Area	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Information Systems and Information Technology	1	2	0	2	2	2	4	2	5	5	5	9
Decision Sciences, Technology Mgmt, & Operations Mgmt	1	2	1	0	1	0	0	1	2	3	1	7
Management, Organizational Behavior, and Strategy	0	2	1	0	0	2	4	2	0	2	1	3
Innovation	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	1	0	0	1	0	0	1	1	1	2	0	0
Economics and Public Policy	2	0	0	1	1	1	0	1	1	1	0	0
Others	0	1	0	0	0	0	1	1	1	1	2	1
Yearly Total	**5**	**7**	**2**	**4**	**4**	**5**	**10**	**8**	**10**	**14**	**9**	**20**
Percent of Total	**1.4%**	**1.9%**	**0.5%**	**1.1%**	**1.1%**	**1.4%**	**2.7%**	**2.2%**	**2.7%**	**3.8%**	**2.5%**	**5.5%**
Area	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**			**Total**	**% of Total**
Information Systems and Information Technology	6	13	15	19	12	25	33	7			180	49.3%
Decision Sciences, Technology Mgmt, & Operations Mgmt	5	5	4	4	6	3	7	2			58	15.9%
Management, Organizational Behavior, and Strategy	2	0	0	2	2	3	1	0			32	8.8%
Innovation	0	1	0	0	0	1	2	0			4	1.1%
Marketing	0	0	0	0	1	2	2	0			13	3.6%
Economics and Public Policy	1	1	1	3	5	0	4	0			24	6.6%
Others	1	1	2	3	14	12	6	7			54	14.8%
Yearly Total	**15**	**21**	**22**	**31**	**40**	**46**	**55**	**16**			**365**	
Percent of Total	**4.1%**	**5.8%**	**6.0%**	**8.5%**	**11.0%**	**12.6%**	**15.1%**	**4.4%**				**100.0%**

3.2.6. Classification by Publication

Table 5 shows the Top 25 research outlets for enterprise adoption research. Of the total of 78 journals surveyed, ten journals published almost half (45.2% / 161 studies) of all studies.

Table 5. Top 25 Journals Publishing Enterprise Adoption Research (1974-2005)

No	Publication	Category	Frequency	Percentage
1	Information and Management	I	27	7.4%
2	Communications of the ACM	I	22	6.0%
3	Journal of Management Information Systems	I	20	5.5%
4	Information Systems Research	I	19	5.2%
5	IEEE Transactions on Engineering Mgmt	II	17	4.7%
6	MIS Quarterly	I	14	3.8%
7	European Journal of Information Systems	I	13	3.6%
8	Management Science	II	13	3.6%
9	Electronic Markets	I	8	2.2%
10	Journal of Computer Information Systems	I	8	2.2%
11	Decision Sciences	II	8	2.2%
12	RAND Journal of Economics	VI	8	2.2%
13	Journal of Org. Computing & E-Commerce	I	7	1.9%
14	Strategic Management Journal	III	6	1.6%
15	Information Systems Journal	I	5	1.4%
16	Journal of Global Information Management	I	5	1.4%
17	OMEGA	II	5	1.4%
18	Academy of Management Review	III	5	1.4%
19	Organization Science	III	5	1.4%
20	Journal of Marketing	V	5	1.4%
21	Decision Support Systems	I	4	1.1%
22	Journal of Electronic Commerce Research	I	4	1.1%
23	Information Resources Management Journal	II	4	1.1%
24	Academy of Management Journal	III	4	1.1%
25	Economics of Innovation & New Technology	VI	4	1.1%

Information & Management published the largest numbers of studies on enterprise adoption. This may be a reflection of the natural fit of the research topic and mission of the journal. Studies published in *Information & Management* serve “managers, professionals, … and senior executives of organizations” with aims to “collect and disseminate information on new and advanced developments in the field of applied information systems; provide material for training and education in administrative data systems; cover the range of information system development and usage in their use of managerial policies, strategies, and activities for business, public administration, and international organizations" and in particular "to provide guidelines and insights on how to undertake successful information technology initiatives and learn to avoid failures through the study of success and failure patterns" (Elsevier, 2006).

Indeed, Category I journals with a practitioners' oriented focus tended to have higher number of studies related to enterprise adoption. Examples include the *Communications of the ACM* (22 studies), *Information Systems Research* (19 studies), and the *Journal of Management Information Systems* (20 studies). Table 6 shows a distribution of Category I journals.

Table 7 shows the distribution of studies in Category II journals. It is noteworthy that 65.4% (38 studies) of Category II studies have been published in three journals, namely *IEEE Transactions on Engineering Management*, *Management Science*, and *Decision Sciences*.

Tables 8-12 show the distribution of enterprise adoption studies in Categories III (32 studies), IV (4 studies), V (13 studies), and VI (24 studies) respectively. The RAND Journal of Economics (8 studies) and the Strategic Management Journal (6 studies) are the top two journals within these categories that publish enterprise adoption research.

Table 6. Distribution of Articles in IS/IT Journals (1974-2005)

IS/IT Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	% of IS/IT Journals	% of All Journals
Behavior and IT	0	0	0	0	1	1	2	1.1%	0.5%
Communications of the ACM	1	3	2	1	6	9	22	12.2%	6.0%
Communications of the AIS	0	0	0	0	0	2	2	1.1%	0.5%
Computer Networks and ISDN Systems	0	0	0	0	1	0	1	0.6%	0.3%
Decision Support Systems	0	0	0	0	1	3	4	2.2%	1.1%
Electronic Commerce Research	0	0	0	0	0	1	1	0.6%	0.3%
Electronic Journal of IS Evaluation	0	0	0	0	0	1	1	0.6%	0.3%
Electronic Markets	0	0	0	0	1	7	8	4.4%	2.2%
European Journal of Information Systems	0	0	0	0	4	9	13	7.2%	3.6%
Information and Management	0	0	2	4	5	16	27	15.0%	7.4%
Information Systems Frontiers	0	0	0	0	0	1	1	0.6%	0.3%
Information Systems Journal	0	0	0	0	0	5	5	2.8%	1.4%
Information Systems Management	0	0	0	0	0	2	2	1.1%	0.5%
Information Systems Research	0	0	1	6	9	3	19	10.6%	5.2%
Int'l Journal of E-Commerce	0	0	0	0	1	1	2	1.1%	0.5%
Int'l Journal of Human-Computer Interaction	0	0	0	0	0	1	1	0.6%	0.3%
Journal of Computer Information Systems	0	0	0	0	0	8	8	4.4%	2.2%
Journal of Electronic Commerce Research	0	0	0	0	0	4	4	2.2%	1.1%
Journal of Global Information Management	0	0	0	0	3	2	5	2.8%	1.4%
Journal of Information Systems	0	0	0	0	1	0	1	0.6%	0.3%
Journal of Information Technology	0	0	0	0	2	1	3	1.7%	0.8%
Journal of IT Theory and Application	0	0	0	0	0	1	1	0.6%	0.3%
Journal of Management Information Systems	0	3	0	3	7	7	20	11.1%	5.5%
Journal of Org. Computing & E-Commerce	0	0	0	0	3	4	7	3.9%	1.9%
Journal of Strategic IS	0	0	0	0	1	0	1	0.6%	0.3%
Journal of the AIS	0	0	0	0	1	1	2	1.1%	0.5%
MIS Quarterly	1	3	2	2	1	5	14	7.8%	3.8%
SIGMIS Data Base	0	0	0	2	0	1	3	1.7%	0.8%
Yearly Total	**2**	**9**	**7**	**18**	**48**	**96**	**180**	**100.0%**	**49.3%**
Percentage within IT/IS journals	**1.1%**	**5.0%**	**3.9%**	**10.0%**	**26.7%**	**53.3%**	**100.0%**		
Percentage within all journals	**0.3%**	**0.8%**	**0.5%**	**0.5%**	**0.3%**	**1.4%**	**3.8%**		

Table 7. Distribution of Articles in DS/TM/OM Journals (1974-2005)

DS/TM/OM Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of DS/TM/OM Journals	Percentage of All Journals
Decision Sciences	0	0	0	2	2	4	8	13.8%	2.2%
European Journal of Operational Research	0	0	0	0	0	3	3	5.2%	0.8%
IEEE Transactions on Engineering Mgmt	0	1	0	1	8	7	17	29.3%	4.7%
Information Knowledge Systems Mgmt.	0	0	0	0	1	1	2	3.4%	0.5%
Information Resources Management Journal	0	0	0	1	3	0	4	6.9%	1.1%
Int'l Journal of Internet and Enterprise Mgmt	0	0	0	0	0	2	2	3.4%	0.5%
Int'l Journal of Production Research	0	0	0	0	0	1	1	1.7%	0.3%
Interfaces	0	0	0	0	1	0	1	1.7%	0.3%
Journal of Purchasing & Supply Chain Mgmt	0	0	0	0	0	1	1	1.7%	0.3%
Management Science	1	1	5	1	4	1	13	22.4%	3.6%
OMEGA	0	0	0	1	3	1	5	8.6%	1.4%
Production & Operations Management	0	0	0	0	0	1	1	1.7%	0.3%
Yearly Total	**1**	**2**	**5**	**6**	**22**	**22**	**58**	**100.0%**	**15.9%**
Percentage of DS/TM/OM Journals	**1.7%**	**3.4%**	**8.6%**	**10.3%**	**37.9%**	**37.9%**	**100.0%**		
Percentage within all journals	**0.3%**	**0.5%**	**1.4%**	**1.6%**	**6.0%**	**6.0%**	**15.9%**		

Table 8. Distribution of Articles in MGT/OB/S Journals (1974-2005)

MGT/OB/S Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of MGT/OB/S Journals	Percentage of All Journals
Academy of Management Journal	1	1	1	1	0	0	4	12.5%	1.1%
Academy of Management Review	0	1	0	2	2	0	5	15.6%	1.4%
Administrative Science Quarterly	1	1	0	0	0	0	2	6.3%	0.5%
Journal of Business Research	0	0	0	0	0	3	3	9.4%	0.8%
Journal of Business Strategy	0	0	0	0	0	2	2	6.3%	0.5%
Journal of General Management	0	0	0	0	0	1	1	3.1%	0.3%
Journal of Management	0	0	1	0	0	0	1	3.1%	0.3%
Journal of Management Studies	0	0	0	0	0	2	2	6.3%	0.5%
Organization Science	0	0	0	2	3	0	5	15.6%	1.4%
Sloan Management Review	0	0	0	1	0	0	1	3.1%	0.3%
Strategic Management Journal	0	0	1	4	1	0	6	18.8%	1.6%
Yearly Total	**2**	**3**	**3**	**10**	**6**	**8**	**32**	**100.0%**	**8.8%**
Percentage of MGT/OB/S Journals	**6.3%**	**9.4%**	**9.4%**	**31.3%**	**18.8%**	**25.0%**	**100.0%**		
Percentage within all journals	**0.5%**	**0.8%**	**0.8%**	**2.7%**	**1.6%**	**2.2%**	**8.8%**		

Table 9. Distribution of Articles in Innovation Journals (1974-2005)

Innovation Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of Innovation Journals	Percentage of All Journals
European Journal of Innovation Management	0	0	0	0	0	2	2	50.0%	0.5%
Int’l Journal of Innovation Mgmt	0	0	0	0	1	0	1	25.0%	0.3%
Journal of Product Innovation Management	0	0	0	0	0	1	1	25.0%	0.3%
Yearly Total	**0**	**0**	**0**	**0**	**1**	**3**	**4**	**100.0%**	**1.1%**
Percentage of Innovation Journals	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**25.0%**	**75.0%**	**100.0%**		
Percentage within all journals	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.3%**	**0.8%**	**1.1%**		

Table 10. Distribution of Articles in Marketing Journals (1974-2005)

Marketing Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of Marketing Journals	Percentage of All Journals
European Journal of Marketing	0	0	0	1	0	0	1	7.7%	0.3%
Industrial Marketing Management	0	0	0	0	0	1	1	7.7%	0.3%
Journal of Marketing	0	0	2	1	0	2	5	38.5%	1.4%
Journal of Marketing Management	0	0	0	1	0	0	1	7.7%	0.3%
Journal of Marketing Research	1	0	0	0	1	0	2	15.4%	0.5%
Journal of the Academy of Marketing Science	0	0	0	0	1	1	2	15.4%	0.5%
Marketing Letters	0	0	0	0	0	1	1	7.7%	0.3%
Yearly Total	**1**	**0**	**2**	**3**	**2**	**5**	**13**	**100.0%**	**3.6%**
Percentage of Marketing Journals	**7.7%**	**0.0%**	**15.4%**	**23.1%**	**15.4%**	**38.5%**	**100.0%**		
Percentage within all journals	**0.3%**	**0.0%**	**0.5%**	**0.8%**	**0.5%**	**1.4%**	**3.6%**		

Table 11. Distribution of Articles in Economics / Public Policy Journals (1974-2005)

ECON / PP Journal Name	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of ECON/PP Journals	Percentage of All Journals
American Economic Review	0	0	0	1	0	0	1	4.2%	0.3%
Applied Economics	0	0	0	0	1	0	1	4.2%	0.3%
Economics of Innovation & New Technology	0	0	0	0	1	3	4	16.7%	1.1%
Int'l Journal of the Economics of Business	0	0	0	0	1	0	1	4.2%	0.3%
Journal of Economic Dynamics & Control	0	0	0	0	0	1	1	4.2%	0.3%
Journal of Economics	0	0	0	0	0	1	1	4.2%	0.3%
Journal of Industrial Economics	0	0	0	1	0	1	2	8.3%	0.5%
RAND Journal of Economics	0	1	2	2	0	3	8	33.3%	2.2%
Research Policy	0	0	1	0	0	0	1	4.2%	0.3%
Review of Industrial Organizations	0	0	0	0	0	1	1	4.2%	0.3%
Structural Change & Economic Dynamics	0	0	0	0	0	1	1	4.2%	0.3%
Telecommunications Policy	0	0	1	0	0	0	1	4.2%	0.3%
World Economy	0	0	0	0	0	1	1	4.2%	0.3%
Yearly Total	**0**	**1**	**4**	**4**	**3**	**12**	**24**	**100.0%**	**6.6%**
Percentage of ECON/PP Journals	**0.0%**	**4.2%**	**16.7%**	**16.7%**	**12.5%**	**50.0%**	**100.0%**		
Percentage within all journals	**0.0%**	**0.3%**	**1.1%**	**1.1%**	**0.8%**	**3.3%**	**6.6%**		

Table 12. Distribution of Articles in Proceedings and Book Chapters (1974-2005)

Others	1974-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	Total	Percentage of Others	Percentage of All Journals
Americas Conference on Information Systems	0	0	0	0	0	11	11	20.4%	3.0%
DIGIT	0	0	0	0	0	2	2	3.7%	0.5%
Hawaii Int'l Conference on System Sciences	0	0	0	0	2	19	21	38.9%	5.8%
International Conference on Information Systems	0	0	0	3	2	6	11	20.4%	3.0%
Communication Theory	0	0	0	0	0	1	1	1.9%	0.3%
Int'l Journal of Medical Informatics	0	0	0	0	0	1	1	1.9%	0.3%
Journal of Construction Engineering & Mgmt	0	0	0	0	1	0	1	1.9%	0.3%
Journal of Medical Systems	0	0	0	0	0	1	1	1.9%	0.3%
Annual Meet'g of the Decision Sciences Institute	0	0	0	0	0	1	1	1.9%	0.3%
Conference of the Academy of Management	0	0	0	0	1	0	1	1.9%	0.3%
Books / Book Chapters	0	0	1	1	1	0	3	5.6%	0.8%
Yearly Total	**0**	**0**	**1**	**4**	**7**	**42**	**54**	**100.0%**	**14.8%**
Percentage of Others	**0.0%**	**0.0%**	**1.9%**	**7.4%**	**13.0%**	**77.8%**	**100.0%**		
Percentage within all journals	**0.0%**	**0.0%**	**0.3%**	**1.1%**	**1.9%**	**11.5%**	**14.8%**		

3.2.7. Classification by Research Methodology

The distribution of studies by research methodology is shown in Figure 13. The most heavily used research method is the survey method (39.3%). Surprisingly few studies have utilized a decision-analytic modeling approach (1.7%). None of the studies included in this review employed an experimental or action research approach. Table 13 shows a summary of all reviewed studies and the corresponding research methodology used.

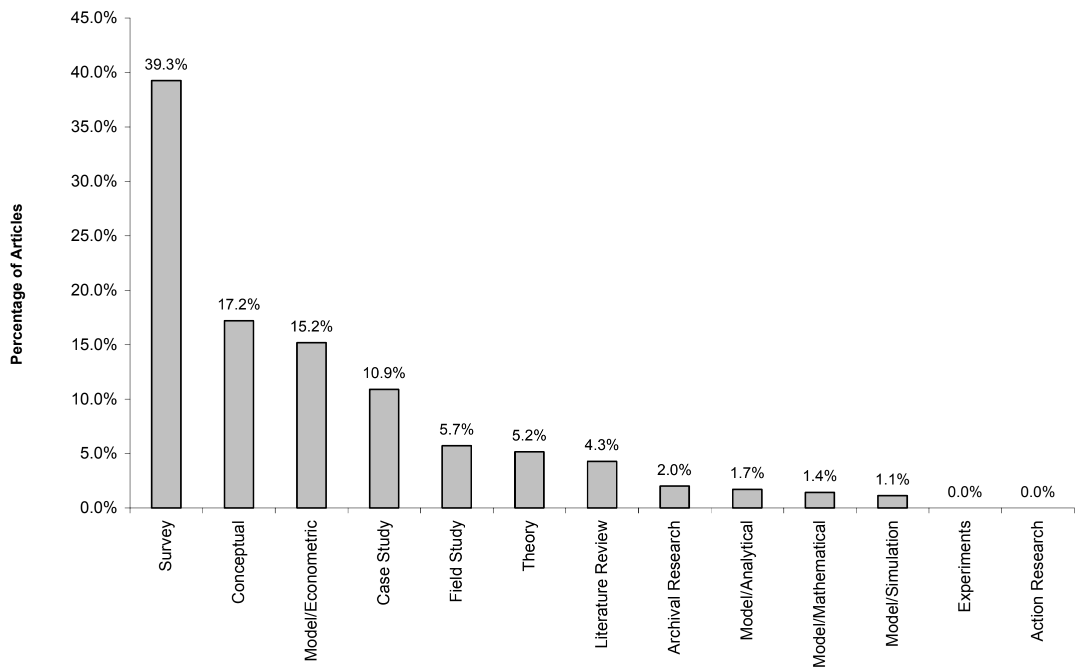


Figure 13. **Distribution of Enterprise Adoption Studies by Research Methodology**

Table 13. Enterprise Adoption References Classified by Research Method

Research Method	References
Survey	Abdul-Gader and Kozar, 1995; Abraham, 2002; Alexander, 2002; Bajwa and Lewis, 2003; Bajwa et al., 2003; Bajwa et al., 1998; Beatty et al., 2001; Brandyberry, 2003; Caldeira and Ward, 2003; Carlson et al., 1999; Chau, 2001; Chau and Hui, 2001; Chau and Tam, 1997; Chau and Tam, 2000; Chengalur-Smith and Duchessi, 1999 Choe, 1996; Choudrie and Lee, 2004; Chow, 2004; Chwelos et al., 2001; Damanpour, 1987; Damanpour and Evan, 1984; Damanpour and Gopalakrishnan, 2001; Danziger and Dutton, 1977; Dasgupta et al., 1999; Daylami et al., 2005; Dedrick and West, 2004, 2004; Doherty et al., 2003; Doherty and King, 2001; Dos Santos and Peffers, 1998; Ellis et al., 1994; Ettlie and Vellenga, 1979; Fichman and Kemerer, 1997; Gatignon and Robertson, 1989; Gibbs and Kraemer, 2004; Goode, 2005; Gopalakrishnan and Damanpour, 2000; Gordon and Gordon, 1992; Grandon and Pearson, 2004; Grandon and Mykytyn Jr., 2004; Grandon and Pearson, 2004, 2003; Grover, 1993; Grover and Goslar, 1993; Hart and Saunders, 1998; Hausman and Stock, 2003; Hollenstein, 2004; Hong and Kim, 2002; Hong and Zhu, 2005; Hu et al., 2002; Hu et al., 2000; Huang et al., 2005; Hwang et al., 2004; Iacovou et al., 1995; Ihlstrom and Nilsson, 2003; Iskandar et al., 2001; Joo and Kim, 2004; Karakaya and Khalil, 2001; Karakostas et al., 2005; Kendall et al., 2001; Kheng and Al-Hawamdeh, 2002; Khoumbati et al., 2005; King and Gribbins, 2002; Kuan and Chau, 2001; Kumar et al., 2002; Lai, 1997; Lai and Guynes, 1997; Lai and Guynes, 1994; Laukkanen et al., 2005; Lee, 2004; Lee and Runge, 2001; Leonard-Barton and Deschamps, 1988; Lewis et al., 2004; Li et al., 2005; Liberatore and Breem, 1997; Lind et al., 1989; Love and Irani, 2004; Lyytinen and Rose, 2003; MacKay et al., 2004; Manross and Rice, 1986; McGowan and Madey, 1998; Mirchandani and Motwani, 2001; Montealegre, 1999; Mustonen-Ollila and Lyytinen, 2004; Nah et al., 2003; O'Callaghan et al., 1992; Pérez et al., 2004; Pflughoeft et al., 2003; Png et al., 2001; Poon, 2000; Premkumar and Potter, 1995 ; Premkumar and Ramamurthy, 1997, 1994, 1995; Premkumar and Roberts, 1999; Qu and Zahedi, 2003; Rai and Bajwa, 1997; Rai and Patnayakuni, 1996; Ramamurthy et al., 1999; Ramiller and Swanson, 2003; Ravichandran, 2005, 2000; Riemenschneider and Mckinney, 1999; Roberts and Pick, 2004; Ruppel and Howard, 1998; Scupola, 2004; Sharma and Rai, 2003; Snyder-Halpern, 2001; Soliman, 2003; Srinivasan et al., 2002; Sriram et al., 2000; Stansfield and Grant, 2003; Straub, 1994; Tan and Fichman, 2002; Teng et al., 2002; Teo et al., 1995; Teo et al., 2003; Teo et al., 2003; Teo and Pian, 2003; Teo and Pian, 2004; Teo and Ranganathan, 2004; Thatcher and Foster, 2003; Thong, 1999; Thong and Yap, 1995; Thong et al., 1996; Tsikriktsis et al., 2004; Van Everdingen et al., 2000; Van Everdingen and Waarts, 2003; Wang and Tsai, 2002; Wang and Cheung, 2004; Wu et al., 2003; Xu et al., 2004; Yao et al., 2002; Zahay and Handfield, 2004; Zhang and Huang, 2004; Zhu et al., 2003; Zhu et al., 2002
Conceptual	Agarwal and Tanniru, 1992; Agarwal et al., 1997; Attewell, 1992; Au and Kauffman, 2001; Bajwa et al., 2004; Belassi and Fadlalla, 1998; Chen et al., 2003; Chwelos et al., 1997; Daft, 1978; Daniels et al., 2001; Downs Jr. and Mohr, 1976; Dutta and Roy, 2003; Ebrahim et al., 2004; Fichman, 2004; Fichman and Kemerer, 1997; Frambach and Schillewaert, 2002; Gera and Chen, 2003; Gopalakrishnan et al., 2003; Grover et al., 1997; Grover et al., 1998; Huff, 1992; Irani and Love, 2000; Johnston and Gregor, 2000; Kambil et al., 2000; Kettinger and Lee, 2002; Kimberly and Evanisko, 1981; King and Kraemer, 1984; Koch et al., 1996; Kottemann and Konsynski, 1984; Kurnia and Johnston, 2000; Kwon and Zmud, 1987; Li, 2004; Lieberman, 1987; Love et al., 2005; Moore and Benbasat, 1991; Nambisan and Wang, 1999, 2000; Olson, 1982; Peffers et al., 2003; Pennings and Harianto, 1992; Proudlock et al., 1998; Raymond, 1985; Ryan and Prybutok, 2001; Saban, 2001; Sarosa and Zowghi, 2003; Schilling, 1998; Scott and Vessey, 2002; Sharma, 1994; Sia et al., 2001; Stratman and Roth, 2002; Tan and Teo, 2000; Tan et al., 2003; Tarafdar and Vaidya, 2003, 2002; Threlkel and Kavan, 1999; Venkatraman, 1985; Walden and Browne, 2002; Wilson et al., 1999; Zelkowitz, 1996; Zmud, 1982

Table 13. (continued)

Research Method	References
Model/Econometric	Abrahamson and Rosenkopf, 1993; Arvanitis and Hollenstein, 2001; Åstebro, 2002; Au and Kauffman, 2003; Baptista, 1999; Bartoloni and Baussola, 2001; Barua and Lee, 1997; Bethuyne, 2002; Cabral and Leiblein, 2001; Chandrashekaran and Sinha, 1995; Chau and Jim, 2002; Dewar and Dutton, 1986; Dong and Saha, 1998; Doraszelski, 2004; Dos Santos, 1991; Fichman, 2004; Forman and Gron, 2005; Gowrisankaran and Stavins, 2004; Gurbaxani, 1990; Gurbaxani and Mendelson, 1990; Han et al., 2004; Hannan and McDowell, 1984; He, 2004; Hu et al., 1997; Huisman and Kort, 2004; Karshenas and Stoneman, 1993; Kauffman and Li, 2005; Kauffman et al., 2000; Kauffman and Mohtadi, 2004; Kim, 2002; King et al., 1994; Lane, 1991; Lange et al., 2004; Lissoni, 2000; Loch and Huberman, 1999; Loh and Venkatraman, 1992; Luque, 2002; Majumdar and Venkataraman, 1998; Mamer and McCardle, 1987; Nault et al., 1997; Norton and Bass, 1987; Rajagopalan, 1999; Ramanathan and Rose, 2003; Robertson and Gatignon, 1986; Rose and Joskow, 1990; Saloner and Shepard, 1995; Tam, 1996; Wade, 1995; Wang et al., 2004; Weber, 2004; Weiss, 1994; Zhu et al., 2004; Zhu and Weyant, 2003
Case Study	Bruque-Cámara et al., 2004; Caldeira and Ward, 2002; Cale and Eriksen, 1994; Chang and Chen, 2005; Chau and Hu, 2004; Ciganek et al., 2005; Dos Santos and Peffers, 1995; Fan et al., 2000; Fichman and Cronin, 2003; Georgiou and Stefaneas, 2002; Ginsberg and Venkatraman, 1992; Goncalves et al., 1999; Heck and Ribbers, 1999; Hovav et al., 2004; Hsiao, 2001; Jarvenpaa and Ives, 1996; Kitchell, 1995; Kshetri and Dholakia, 2002; Lapointe et al., 2002; Lee and Cheung, 2004; Levy and Powell, 2003; Liu Sheng et al., 1998; Looi, 2005; Love et al., 2005; Mehrtens et al., 2001; Meyer and Goes, 1988; Mitropoulos and Tatum, 2000; Morgan, 2003; Mustonen-Ollila and Lyytinen, 2003; Oliver and Romm, 2002; Rajagopal, 2002; Sandberg and Vinberg, 2000; Scupola, 2002; Tan and Raman, 2002; Van Den Hooff, 2005; Vedder et al., 1999; Wilkins et al., 2001; Yeung et al., 2003
Field Study	Brown and Lockett, 2004; Czepiel, 1974; Dembla et al., 2003; Drury and Farhhomand, 1999; Eder and Igbaria, 2001; Fichman and Kemerer, 1993; Grover and Teng, 1992; Harrisburg et al., 1999; Huff and Munro, 1985; Itami and Numagami, 1992; Lyytinen and Rose, 2003; Oliver, 2002; Ramamurthy and Premkumar, 1995; Ranganathan et al., 2002; Sharma and Rai, 2000; Sharma et al., 2004; Shi and Wright, 2003; Sia et al., 1998; Sia et al., 2004; Soliman and Janz, 2004
Theory	Abrahamson, 1991; Au and Kauffman, 2003; Fichman, 2001; Fidler and Johnson, 1984; Gallivan, 2001; Harrison et al., 1997; Hart and Saunders, 1997; Keen, 1981; King, 1978; Klein and Sorra, 1996; Lee, 1998; Orlikowski and Barley, 2001; Quirmbach, 1986; Raho et al., 1987; Riemenschneider et al., 2003; Swanson, 1994; Swanson and Ramiller, 1997; Tornatzky and Klein, 1982
Literature Review	Attewell and Rule, 1984; Boynton and Zmud, 1987; Cooper and Zmud, 1990; Damanpour, 1991; Fichman, 1992; Frambach, 1993; Gopalakrishnan and Damanpour, 1997; Jevaraj et al., 2004; Kurnia and Johnston, 2002; Lai and Mahapatra, 1997; Lin, 2003; Premkumar, 2003; Prescott and Conger, 1995 ; Straub and Wetherbe, 1989; Taylor and McAdam, 2004
Archival Research	Antonelli, 1989, 1986; Bretschneider and Wittmer, 1993; Burke et al., 2002; Gremillion, 1984; Lee and Clark, 1999; Lee and Grewal, 2004
Model/Analytical	Barua et al., 1995; Bouchard, 1993; Rouse and Acevedo, 2004; Rouse et al., 2000; Sarkis and Sundarraj, 2001; Udo and Kirs, 2002
Model/Mathematical	Amiri, 2002; Chambers, 2004; Kaefer and Bendoly, 2000; Rajagopalan et al., 1998; Smith, 2004
Model/Simulation	Abrahamson and Rosenkopf, 1997; Armstrong and Sambamurthy, 1999; Decanio et al., 2000; Dutta, 2001

3.2.8. Classification by ICT Type

Figure 14 shows the distribution of studies by ICT type and indicates that relatively more studies have been published with respect to General IS/IT (103 studies), Enterprise IS (79 studies), and E-Business/E-Commerce (75 studies). General IS/IT involves the examination of ICT such as business computing hardware, e-mail solutions, spreadsheet applications, facsimile technologies, operating systems, middleware technologies, and open source software (Zmud, 1982; Attewell, 1992; Grover & Teng, 1992; Straub, 1994; Jarvenpaa & Ives, 1996; Caldeira & Ward, 2003; Dedrick & West, 2004a; b). Enterprise IS includes the examination of enterprise resource planning (ERP) solutions, electronic data interchange (EDI), supply chain management (SCM), accounting information systems, customer relationship management (CRM), executive information systems (EIS), knowledge management systems, and strategic information systems (Bouchard, 1993; Teo, Tan, & Wei, 1995; Barua & Lee, 1997; Premkumar & Ramamurthy, 1997; Hart & Saunders, 1998; Lee, 1998; Heck & Ribbers, 1999; Lee & Clark, 1999; Ramamurthy, Premkumar, & Crum, 1999; Van Everdingen, Hillegersberg, & Waarts, 2000; Chau, 2001; Chwelos, Benbasat, & Dexter, 2001; Kuan & Chau, 2001; Hong & Kim, 2002; Rajagopal, 2002; Ranganathan, Dhaliwal, & Teo, 2002; Zahay & Handfield, 2004; Laukkanen, Sarpola, & Hallikainen, 2005). E-Business/E-Commerce includes ICT such as web-based applications, e-Trading solutions, Internet Banking, electronic bill payment solutions, and websites (Ellis, Jones, & Arnett, 1994; Hsiao, 2001; Alexander, 2002; Georgiou & Stefaneas, 2002; Kshetri & Dholakia, 2002; Zhu, Kraemer, & Xu, 2002; Pflughoeft, Ramamurthy, Soofi, Yasai-Ardekani, & Zahedi, 2003; Zhu, Kraemer, & Sean Xu, 2003; Gibbs & Kraemer, 2004; Daylami, Ryan, Olfman, & Shayo, 2005). A complete list of ICT types is shown in Table 14.

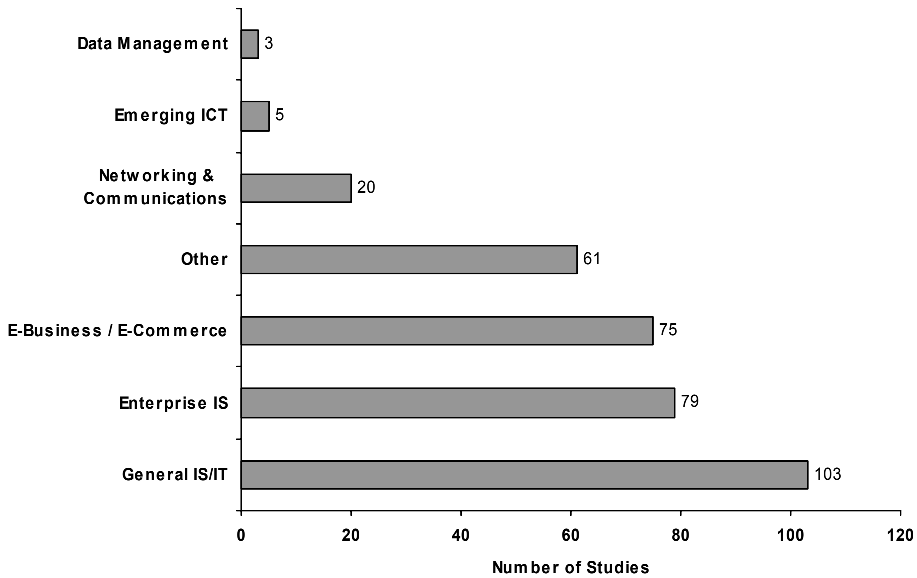


Figure 14. **Distribution of Enterprise Adoption Articles by ICT Type**

3.2.9. Summary

As the nature of research on enterprise adoption of ICT is difficult to confine to specific disciplines, relevant material is scattered across various journals, book chapters, and conference proceedings. An extensive literature search was conducted to identify enterprise adoption related articles from a wide variety of publication outlets. This resulted in the identification of 365 studies published between 1974 and 2005. Although the review cannot be considered exhaustive due to omission of working papers and doctoral dissertations, it does provide reasonable insights to the state-of-the-research.

Results show that the topic has seen tremendous growth in the last few years and continues to receive great attention by researchers and practitioners alike. Information Systems and Information Technology (Category I) journals in particular seemed to be the primary outlets for enterprise adoption research.

Table 14. Distribution of Enterprise Adoption Articles by ICT Type

ICT Type	Total	ICT Type	Total
Accounting Information Systems	1	Internet	14
Administrative IS	3	Internet Banking	3
ASP	1	Internet Standards	1
Automated Teller Machines	4	Inter-Organizational Systems	11
BITNET	1	Intranet	1
Broadband Technologies	1	IS/IT	86
Business Computing	2	IS/IT Outsourcing	1
Business Process Innovations	4	ISDN	3
CAD	3	IT Infrastructure	2
CASE	5	IT Outsourcing Processes	1
Client/Server Technologies	2	IT Platform	1
Clinical Information Systems	1	IT Process Innovations	2
CNC	1	Knowledge Management Systems	1
Collaborative Technologies	3	Local Area Networks	1
Communication Technologies	3	Mainframe Computing	1
Computers	2	Manufacturing IT	7
CRM	2	Media Technologies	1
Data Warehousing	1	Microcomputers/Workstations	2
DBMS	1	Middleware	1
Digital Imaging Technologies	2	Mobile/Wireless ICT	4
E-Business / E-Commerce	39	Network Services	2
EDI	26	Object-Oriented Programming	1
E-Government Applications	1	Online Documentation System	1
Electronic Bill Payment	4	Open Source Software	3
E-mail	3	Open Systems	2
e-Marketplace	2	Process Innovations	1
Emerging IT	1	SCM	1
Enterprise Application Integration	1	Software Process Innovations	4
Enterprise Systems	3	Strategic Information Systems	1
E-Procurement Systems	3	Telemedicine Technologies	4
ERP	10	Telephone	1
E-Trading	2	Teleworking	3
Executive Information Systems	4	Transportation Technologies	1
Expert Systems	2	Virtual Work Environments	2
Extranet	1	Web	2
Facsimile	1	Web Services	2
Financial EDI	4	Web Technology	6
General Innovations	9	Web-Based Services	2
Hospital Information Systems	1	Website	1
Insurance IT	1	XML	1

However, a growing interest can also be identified from researchers in other complementary disciplines (Categories II-VI). Studies have predominantly used a survey-type of approach to understanding enterprise adoption, while General IS/IT, E-Business / E-Commerce, and Enterprise IS are the most studied types of ICT.

3.3. Theory

3.3.1. Overview

The previous section has highlighted the significant interest in enterprise adoption research in a wide variety of disciplines over the past three decades. Given the multi-disciplinary nature of the topic, it is without surprise that researchers have employed a variety of complementary theoretical lenses to shed light on enterprise adoption issues.

In spite of the vast number of studies and methodologies, enterprise adoption research is broadly composed of four inter-related categories. The first category is concerned with understanding how and why ICT diffuses over time and explores salient characteristics that influence the adoption decision. The second category explores important organizational characteristics that lead to the decision to adopt ICT. The third category is concerned with discerning the different stages and processes involved in enterprise adoption of ICT. The final category explores contextual factors and conditions that influence and facilitate enterprise adoption of ICT.

Theories and frameworks most commonly used to describe these research foci include the Innovation Diffusion Theory (Rogers, 1995), Organizational Innovation Theory (Tornatzky & Klein, 1982; Depietro, Wiarda, & Fleischer, 1990; Damanpour, 1991), Process Theory (Raho et al., 1987), and Institutional Theory (Abrahamson & Rosenkopf, 1993; King, Gurbaxani, Kraemer, McFarlan, Raman, & Yap, 1994; Teo, Wei,

& Benbasat, 2003; Gibbs & Kraemer, 2004). A summary of research approaches and corresponding questions and foci are presented in Table 15. The following sections discuss the four research approaches in further detail.

Table 15. Enterprise Adoption of ICT: Research Questions, Foci, and Theories

Research Question	Research Approach	Research Focus
1. What is the pattern of ICT diffusion?	Innovation Diffusion Theory	Addresses the diffusion of ICT and determines salient characteristics of ICT that influence the adoption decision
2. What determines organizational innovativeness?	Organizational Innovation Theory	Addresses the determinants of the innovativeness of organizations
3. What are the contextual factors and conditions that facilitate enterprise adoption of ICT?	Institutional Theory	Addresses the contextual factors and conditions that facilitate enterprise adoption of ICT
4. What are the processes that organizations go through when adopting ICT?	Process Theory	Addresses the processes of adoption of ICT in enterprises
5. Why do enterprises adopt new ICT and what impact does it have?	Theory of Enterprise Transformation	Addresses the catalysts of enterprise adoption of ICT and describes the transformational impact

3.3.2. Innovation Diffusion Theory

Innovation Diffusion Theory (IDT) has been the basis of many studies to explain the adoption and diffusion of ICT.[3] It is generally used in the study of how, why, and at what rate innovations are accepted by individuals or other units of adoption (Rogers, 1995). Innovation diffusion research has its origins in the field of sociology and dates as far back as 1903 when Gabriel Tarde first plotted the original S-shaped diffusion curve (Tarde, 1903). The key parameter in the S-shaped diffusion curve is the slope of the "S" as shown in Figure 15. Some innovations diffuse very rapidly, thus, creating a steep S-

[3] It should be noted that adoption refers to the decision of any individual or organization to make use of an innovation, whereas diffusion refers to the accumulated level of users of an innovation in a market (Rogers 1995).

curve (Innovation 1); other innovations have a slower rate of adoption, creating a more gradual slope of the S-curve (Innovation 3).

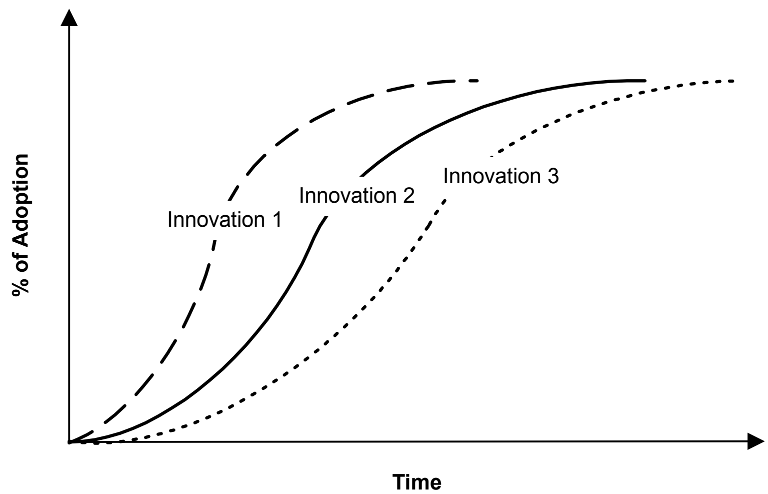


Figure 15. Sample "S" Curves of Innovation Diffusion

One of the early seminal studies on the diffusion of innovations was published by the sociologists Ryan and Gross (Ryan & Gross, 1943) in the 1940's. In this study, the authors examined the diffusion of hybrid seed among farmers in Iowa. The rate of adoption of this agricultural innovation followed an S-shaped normal curve when plotted on a cumulative basis over time (Rogers, 1995). This rate of adoption curve was indeed similar to the S-shaped diffusion curve graphed by Tarde some forty years earlier.

While there are several models, which explain the mechanics of diffusion (see (Baptista, 1999; Drury & Farhhomand, 1999; Premkumar, 2003) for a complete review), one of the most widely used and formalized models is Rogers' Diffusion of Innovations (DOI) theory (Rogers, 1995). Drawing on the aforementioned studies and an examination of over 3,000 innovations, Rogers seminal work observed that the S-shaped curve was still of current importance because most innovations displayed an S-shaped rate of diffusion. In particular, Rogers (1995) argued that diffusion is the "process by which an innovation is communicated through certain channels over a period of time among the members of a social system." This definition highlights four core elements of diffusion, namely (1) the innovation, (2) communication channels, (3) time, and (4) the social system.

An innovation is considered an idea, practice, or object that is perceived as new by an individual or unit of adoption (Rogers, 1995). Daft (1978) extended this concept to the firm level and defined an organizational innovation as "the adoption of an idea or behavior that is new to the organization adopting it." Therefore, an innovation need not necessarily refer to a technology. It may also refer to a renewal in terms of thought and action as well (Thong, Yap, & Raman, 1996). Rogers (1995) identified five innovation attributes that regularly determined the adoption of innovations. He defined them as:

- **Relative Advantage** is the degree to which an innovation is perceived as being better than its precursor. The degree of relative advantage may be measured in economic terms, but intangible aspects such as convenience and satisfaction are also important factors. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.
- **Compatibility** is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible.

- **Complexity** is the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.
- **Observability** is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.
- **Trialability** is the degree to which an innovation may be experimented with before adoption. New ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, who can learn by doing.

These five attributes have been extensively utilized by many researchers to explain the adoption and diffusion of ICT innovations. However, among these attributes, only relative advantage, compatibility, and complexity have been consistently identified as critical ICT adoption factors (Kwon & Zmud, 1987).

The next core element in Rogers' DOI theory is the type of communication channel. Communication is considered the process by which participants create and share information with one another in order to reach a mutual understanding (Rogers, 2003). A communication channel is the means by which messages get from one individual to another (Rogers, 2003). Most individuals (and organizations alike) evaluate an innovation, not based on scientific research by experts, but through the subjective evaluations of peers within their network who have adopted the innovation (Rogers, 1995).

The third element in the DOI theory is time. The time dimension is involved in three distinct ways. First, time is involved in the innovation-decision process. The innovation-decision process is the mental process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the innovation, and to confirmation of this decision (Kwon & Zmud, 1987). The decision-making unit seeks information at various stages in the innovation-decision process in order to decrease uncertainty about an innovation's expected consequences.

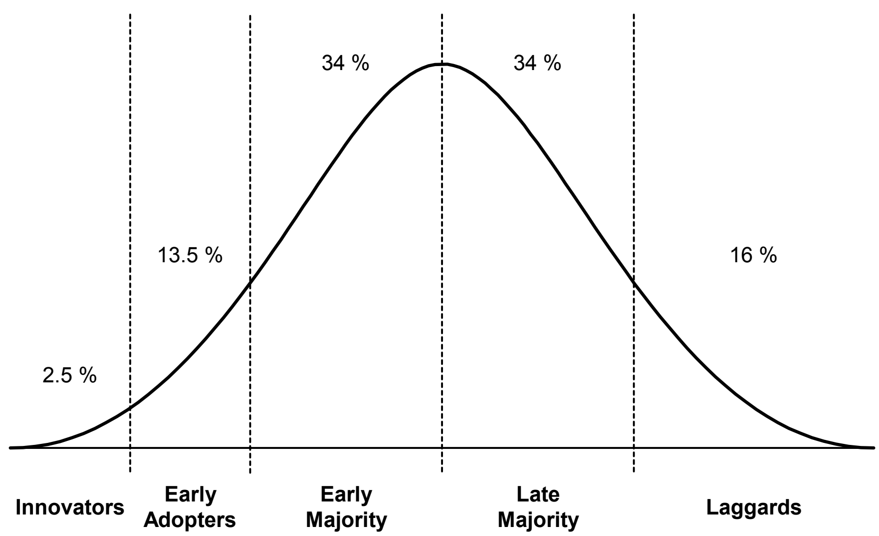


Figure 16. Adopter Types Classified By Innovativeness

The second way in which time is involved in diffusion is in the innovativeness of the adopting unit (Klein & Sorra, 1996). Innovativeness is the degree to which the adopter is relatively earlier in adopting innovations than other members of its social system (Rogers, 1995). Rogers (1995) identifies five adopter categories (see Figure 16) on the basis on their innovativeness: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards.

- **Innovators** are the first 2.5 percent to adopt an innovation. Innovators are eager to try new ideas and technology. They are prepared for the occasional setback as they try new approaches and are not discouraged if the intervention proves unsuccessful.
- **Early adopters** are the second category and represent the next 13.5 percent to adopt an innovation. Rogers notes that this group is a "more integrated part of the organization" than the Innovators (p. 248). The Early Adopters have a high degree of opinion leadership; this means that others in the organization respect the Early Adopters' ideas and look to them for cues, advice, and information about adopting new technologies. Consequently, this is a group that should be targeted in initial organizational change efforts. Early Adopters set an example for, and increase others' confidence about, adapting to an innovation.
- **Early majority** is the third category and represent the next 34 percent. This group of adopters is cautious toward change and new ideas or technology. The Early Majority seldom assumes a leadership position, and so rarely leads major change efforts, but they are willing to adopt new ideas and technology. The Early Majority look to the Early Adopters for clues indicating the success or failure of the innovation.

- **Late majority** represents the next 34 percent of adopters. The Late Majority view change with skepticism and caution, but feel pressure to embrace change from others in the organization who have already adopted an innovation.
- **Laggards** are the last 16 percent of all adopters. The Laggards are traditional in their outlook and are the last individuals in the institution to adopt a change. They have no opinion leadership. Rogers notes that the Laggards' "point of reference is the past [and] decisions are often made in terms of what has been done previously" (p. 250). When Laggards finally adopt an innovation, the Innovators have likely already introduced another idea or technology into the organization, thus beginning a new cycle of change. The Laggards' adoption of innovations, technologies, and programs lags behind their awareness and knowledge of innovation.

The third way in which time is involved in diffusion is in the rate of adoption. The rate of adoption is the relative speed with which an innovation is adopted by members of a social system. The rate of adoption is usually measured as the number of members of the system that adopt the innovation in a given time period. As shown previously, an innovation's rate of adoption is influenced by the five perceived attributes of an innovation.

The fourth main element in the diffusion of new ideas is the social system. A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The social system constitutes a boundary within which an innovation diffuses.

In summary, innovation diffusion research has focused on four elements relevant to the study of ICT adoption: (1) the characteristics of an innovation which may influence its adoption; (2) the decision-making process that occurs when individuals (or the decision-making unit) consider adopting a new idea, product or practice; (3) the characteristics of individuals (or the decision-making unit) that make them likely to adopt an innovation; and (4) communication channels used in the adoption process.

However, there are several assumptions of Innovation Diffusion Theory that do not directly hold in the organizational adoption decision context. Original innovation diffusion research dealt with the adoption behavior of individuals. As organizations became the adopters, studies simply replaced individual characteristics with organizational variables. The process of diffusion and adoption of ICT among organizations, however, is very different from that among individuals. This simplistic morphication of organizational characteristics contributed to disappointing results of diffusion theory in the organizational context. The realization of the limitations of innovation diffusion models in incorporating issues unique to organizations led to the growth of the organizational innovativeness stream of research.

3.3.3. Organizational Innovation Theory

While Innovation Diffusion Theory focused on innovation characteristics and the processes that lead to the diffusion and adoption of ICT among individuals, the literature on organizational innovativeness explored the influence of organizational characteristics on adoption decisions (Kimberly & Evanisko, 1981; Meyer & Goes, 1988; Damanpour, 1991). As previously mentioned, this perspective emerged as researchers recognized that decisions at the enterprise level are often too difficult and complex to be captured by an individual's cognitive abilities (Tornatzky & Klein, 1982) and could not be directly addressed with traditional technology adoption and diffusion models (Rogers, 1995).

The majority of studies within this research stream tended to focus on the influence of organizational characteristics, perhaps because it has been argued that structural variables are the primary determinants of organizational innovation (Damanpour & Evan, 1984). These characteristics include organizational size (Gremillion, 1984), structure (McGowan & Madey, 1998), management (Thong et al., 1996) and strategic posture (Agarwal & Tanniru, 1992).[4]

Organizational size has repeatedly been found to influence the propensity of innovation adoption. Most commonly, size is found to be positively related to innovation adoption. Larger organizations generally feel a higher need to adopt innovations in order to support or improve their processes and activities. On the other hand, it is argued that smaller organizations are more flexible and innovative themselves, resulting in an enhanced receptiveness towards new ICT. These mixed findings on the role of size may be largely attributable to size's correlation with other organizational variables, such as structure, strategy and culture.

Organizational structure has also been found to either facilitate or inhibit innovation adoption. (Zaltman, Duncan, & Holbek, 1973) propose that more formalized and centralized organizations (often the larger firms) are less likely to initiate innovation adoption decisions, but are better equipped to actually implement innovations. The opposite holds for organizations that are highly complex or specialized.

[4] Despite the gamut of studies on organizational innovativeness, no definitive set of characteristics for differentiating more from less innovative organizations has yet emerged from this research. These four determinants, however, generally seemed to influence organizational innovativeness.

The role and characteristics of organizational management has also been shown to influence organizational innovativeness (Thong & Yap, 1995). (Cohen & Levinthal, 1990) argue that the ability of an organization to recognize the value of new external information, assimilate it, and apply it are critical to its innovative capabilities. They termed this an organization's absorptive capacity (Cohen & Levinthal, 1990). Other studies found that managerial characteristics such as attitude towards change (Dewar & Dutton, 1986), ICT knowledge (Fichman & Kemerer, 1997), work experiences (Raymond, 1985), tenure and educational background (Armstrong & Sambamurthy, 1999) also have a significant impact on enterprise adoption of ICT. In general, top management support has been shown to be a factor of critical importance in successful adoptions and implementations of ICT.

In his seminal work, (Damanpour, 1991) defined organizational innovativeness as the degree to which an organization is receptive to new products or ideas. It appears that this is directly related to the strategic posture of a firm. In fact, (Chandrashekaran & Sinha, 1995) relate innovativeness (i.e. openness to new ideas) with the capacity to innovate (i.e. the ability of the organization to adopt and implement innovations successfully). Further, the authors include structural and process characteristics (e.g. market intelligence processing and strategic planning) and cultural characteristics (e.g. learning and development, and participative decision-making) in their model to explain both outcome variables. In the same line, a study by (Han, Kauffman, & Nault, 2004) provides evidence that a firm's market orientation facilitates behavioral innovativeness (i.e. innovativeness in terms of time of adoption, Rogers 1995). The authors defined market orientation as the strategic disposition of a firm to deliver superior customer value by means of continuous information gathering and coordination of customer needs, competitor capabilities and other market parties (Sharma, 1994). Similarly, (Srinivasan, Lilien, & Rangaswamy, 2002) find support for the fact that technological opportunism (i.e. a firm's capability for sensing and responding to technological developments) affects adoption. Hence, it appears that organizations that pursue an aggressive, innovation oriented business strategy, are more likely to fuel their activities with an orientation that is open to innovation themselves.

Subsequent studies added several other organizational characteristics that influenced the adoption of ICT. The availability of organizational resources, such as financial, human, and physical was shown to be of significant importance in the adoption decision and implementation success (Depietro et al., 1990). The existence of a strong organizational reward and support system also led to successful ICT adoptions.

The vast literature on organizational innovativeness has provided a number of additional determinants that led to enterprise adoption of ICT. Yet, one of the most prevalent critiques was that this literature base assumed enterprise adoption of ICT to be driven by purely intra-organizational, rationalistic, and deterministic strategic choices independent of the external environmental context (Zhu et al., 2002). Studies from the fields of organizational behavior and strategic management, however, provided strong evidence that organizational decision-making was also influenced by external environmental factors. This shortcoming of enterprise adoption models led to the examination and integration of institutional theory concepts in enterprise adoption research.

3.3.4. Institutional Theory

Competitive pressures, network externalities, vendor influence, and regulatory forces are all environmental factors that potentially impact an organization's decision to adopt ICT. Emerging, and networked ICT in particular, diffuse and are adopted more rapidly when "others observe and imitate the early adopters to replicate the success or to avoid being perceived as laggards, or when they communicate with these early adopters and are persuaded, induced, or coerced to adopt" (Contractor & Eisenberg, 1990). Thus, an understanding of the institutional environment is of utmost significance.

Institutional Theory resolves this concern by positing that organizations respond to a broader environment of other organizations and stakeholders and are subject to various kinds of pressures. At its core, institutional theory tries to explain institutional isomorphism, i.e., the constraining process that forces one unit in a population to resemble other units that face the same environment (Abrahamson & Rosenkopf, 1993; King et al., 1994; Montealegre, 1999). Institutional pressure can be applied by "rules, laws, public opinion, views of important constituents such as customers and suppliers, knowledge legitimated through education and universities, and social prestige" (DiMaggio & Powell, 1983) distinguished between three types of isomorphic forces - coercive, mimetic, and normative.

Mimetic forces influence organizations operating in uncertain environments and are defined as those forces, which induce an organization to mimic other organizations that are perceived to be successful. They manifest when technologies, processes, and goals are vague and ambiguous (King et al., 1994). This is particularly true of the emerging ICT industry, such as mobile ICT, in which technologies, processes, and outcomes are still in the nascent stage and associated with high uncertainty. Thus, organizations react to uncertainty by implementing mobile ICT initiatives that mimic firms with successful mobile ICT implementations programs.

Coercive forces are exerted on organizations by other organizations upon which it is dependent, such as suppliers, present and potential clients, and regulatory agencies. Suppliers could enforce the implementation of specific mobile ICT to gaining greater information visibility (e.g. WalMart’s RFID program). The presence of initiatives in competing organizations also drives organizations toward implementing new ICT. Therefore, coercive forces acting on the organization induce the organization to make the required changes.

Normative forces arise from professionalization, defined as a move by organizations to define the conditions and methods of adopting and implementing emerging ICT. In the context of emerging ICT adoption, normative forces faced by an organization increase by a higher level of adoption of the ICT among its suppliers and customers, and by its participation in professional, trade, or business organizations that sanction the adoption of the emerging ICT.

Subsequent enterprise adoption studies incorporated these three forces and provided significant empirical support for their relevance. (Wilkins, Castleman, & Swatman, 2001), for example, highlighted the impact of customers and suppliers on the ICT adoption decision, while (Ginsberg & Venkatraman, 1992) showed that vendor support and marketing efforts played an important role as well. In general, external influences were shown to be important forces that had to be considered in the enterprise adoption literature.

3.3.5. Process Theory

The fourth theoretical stream in enterprise adoption research focused on exploring the stages organizations go through in adopting and implementing ICT using process theory. Process theory is a "commonly used form of scientific research study in which events or occurrences are said to be the result of certain input states leading to a certain outcome (output) state, following a set process.' The central concept of process theory is the development and use of stage models (Markus & Robey, 1988). Stage models describe how adoption and implementation processes unfold, with a particular focus on the time-ordering of key events, and identifying conditions necessary for certain outcomes to occur (Gallivan, 2001)

ICT adoption and diffusion studies have used various stage models. One of the earliest models of adoption and diffusion of organizational innovations is Thompson's three-stage model of initiation, adoption, and implementation (Thompson, 1965). (Zaltman et al., 1973) distinguished between only two main enterprise adoption stages: initiation and implementation. In the initiation stage, the enterprise becomes aware of the innovation, forms an attitude towards it, and evaluates the new ICT; the initiation stage thus encompasses awareness, consideration, and intention sub-stages. In the implementation stage, the enterprise decides to purchase and make use of the ICT. The actual adoption decision occurred between the initiation and the implementation stage.

Rogers proposed a five-stage model of ICT adoption and implementation in enterprises (Rogers, 2003). He defined the adoption process as "the process through which an adopter unit passes first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision." In particular, Rogers argued that the decision to adopt and use unfolds in the following five stages: awareness stage of acquiring information about the innovation, persuasion stage of being persuaded to adopt the innovation, decision stage of deciding to adopt, implementation stage of implementing the innovation and using it and finally the confirmation stage of evaluating the actual outcomes with expectations

While Rogers' model was the first process model of organizational adoption and implementation, there have been many other stage models proposed over the years. In the IS literature, the best-known model describing technology implementation in organizations is the six-stage model proposed by Zmud and colleagues (Kwon & Zmud, 1987; Cooper & Zmud, 1990b). Building on the early stage models, the stages in this model of enterprise adoption are defined as follows:

- During the **Initiation** stage a match is found between an innovation and its application in the organization
- In the **Adoption** stage, a decision is reached to invest resources to accommodate the implementation effort
- In the **Adaptation** stage, the innovation is developed, installed and maintained. Procedures are developed and revised. Members are trained both in the new procedures and in the innovation
- During the **Acceptance** stage, organizational members are induced to commit to the innovation's usage
- In this **Routinization** stage usage of the technology application is encouraged as a normal activity

- The **Infusion** stage is characterized by increased organizational effectiveness by using the IT application in a more comprehensive and integrated manner.

An ICT adoption is initiated when an organization recognizes (awareness) either a need for change, usually triggered by a problem or opportunity (need-pull) or when internal or external forces promote a new technology that promises to enhance organizational performance (technology-push). (Rouse, 2005a) refers to this as the existence of value deficiencies, either experienced or expected. Initiation involves scanning, gathering and evaluating information regarding problems, opportunities, and technology capabilities, and finding a match between problems/opportunities and technological solution. Under a rational model of innovation progression, initiation leads to adoption if a proper fit is found between organizational needs and technological capabilities. Adoption involves rational and political negotiations to get organizational backing and a decision to invest resources necessary to accommodate the change-effort associated with the introduction and use of technology to solve organizational problems or to take advantage of new opportunities.

A conceptual summary of the various stage models used in enterprise adoption and implementation research is shown in Figure 17.

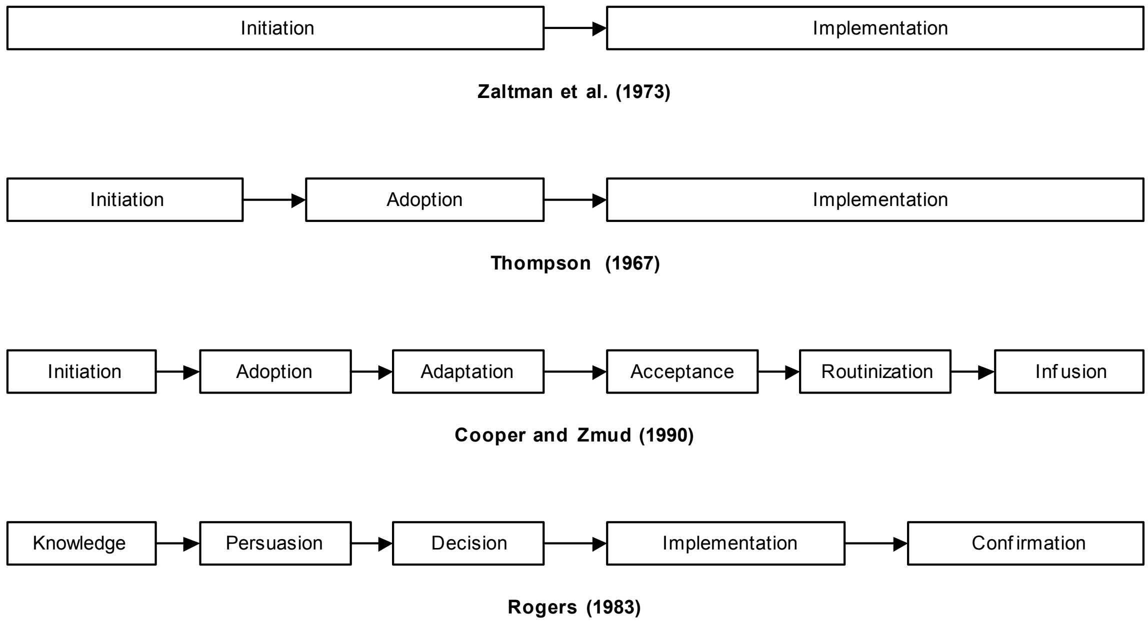


Figure 17. Comparison of Enterprise Adoption Stage Models

The use of process theory and stage models led to another very important differentiation in enterprise adoption research. (Zaltman et al., 1973) posited that two levels of enterprise adoption decisions existed. The first decision describes a firm-level decision to adopt the innovation (primary adoption), followed by actual implementation, which includes individual adoption by users (secondary adoption). This process has often been labeled a two-step adoption (Leonard-Barton & Deschamps, 1988) or contingent adoption decision (Zaltman et al., 1973), because employees within an organization cannot adopt the innovation until primary adoption has occurred at a higher level of authority; actual user adoption is thus contingent on a prior event. When the usage of a new ICT by individuals is contingent upon a prior organizational adoption decision, it is referred to as a contingent innovation decision or “top-down” or “forced adoption” (Gallivan, 2001; Frambach & Schillewaert, 2002). However, many organizational adoptions of ICT are also driven by a "bottom-up" approach, in which individuals adopt the innovation first. As more individuals adopt and use the new ICT, enterprises become aware of its value, and in turn make an organizational decision to adopt and implement it enterprise-wide. This simple two-level framework is depicted in Figure 18.

		Does the Enterprise Adopt the ICT?	
		YES	NO
Do Employees Adopt the ICT?	NO	Authority-Based ICT Adoption	Bottom-Up Adoption
	YES	Adoption, but no Deployment	Non-Adoption

Figure 18. A Taxonomy of Two-Stage Enterprise Adoption Types

The two-level perspective on enterprise adoption is consistent with arguments of innovation diffusion theory. ICT adoptions can only be considered a success when the innovation is accepted and integrated into the organization and the target adopters demonstrate commitment by continuing to use the ICT over a period of time (Bhattacherjee, 1998).

In summary, studies of ICT adoption have generally used some form of a stage model, typically consisting of an initiation–adoption stage followed by various stages of diffusion, culminating in institutionalization and widespread use of the innovation within the adopting unit. Stage models essentially capture the organizational learning process where adopter go over the learning curve, understand the potential of the innovation, identify and develop sophisticated uses for the innovation, modify their work practices to suit the innovation, and develop suitable organizational control procedures to manage the innovation and the new work environment. These changes take time and organizations have greater success with a gradual progression from one stage to the next. The use of process theory to formulate stage models provides researchers with means to describe the temporal sequences of how initiation, adoption and implementation processes unfold and the ability to identify conditions necessary for their successful outcomes.

3.3.6. Theory of Enterprise Transformation

Today's business executives often face very complex and strategic decisions in order to maneuver their organizations through changing times. Driven by competitive pressure and other environmental changes, decision makers must have an understanding how to grow the organization, sustain and create competitive advantages, implement change, address uncertainty, and strategically manage these challenges (Rouse, 2005a).

While process improvement and other incremental changes may be able to solve some of the challenges enterprises face, in some instances it may require a more significant change in organizational structure, leadership, relationships, and product and service offerings. In other words, it may require fundamental enterprise transformation. Although plenty of anecdotal evidence of enterprise transformations exists, theoretical foundations are rather scarce.

A key exception is the theory of enterprise transformation (TOET) (Rouse, 2005a; 2006). The TOET posits that transformation is "*driven by experienced and/or anticipated value deficiencies that result in significantly redesigned and/or new work processes as* *determined by management's decision making abilities, limitations, and inclinations, all in the context of the social networks of management in particular and the enterprise in general* (Rouse, 2005b)." Based on the concept of enterprise as a complex system (Rouse, 2005a), Rouse further argues that the "nature and extent of transformation are context dependent." Indeed, organizational change decisions are both based and influenced by a range of intra- and extra-organizational factors. In order to further understand and illustrate the context and nature of enterprise transformation, (Rouse, 2005b) developed a three-dimensional framework, which he found provides a useful categorization of a broad range of enterprise transformations (see Figure 19). More specific examples can be found in (Rouse, 2006).

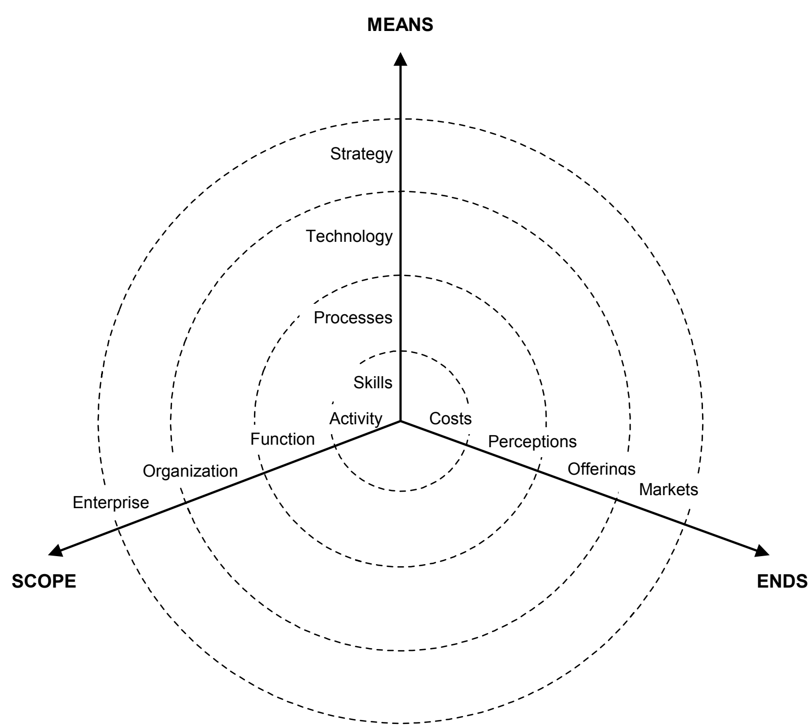


Figure 19. Enterprise Transformation Framework

The goals or ends pursued dimension of this framework tends to differentiate the transformation initiatives. The approach or means dimension describes both the goals pursued and the nature and competencies of the enterprise. The ends and means dimensions combined with the level of enterprise integration influences the overall scope of transformation.

Based on these three dimensions, (Rouse, 2005b) further argues that “the ends of transformation can range from greater cost efficiencies, to enhanced market perceptions, to new product and service offerings, to fundamental changes of markets. The means can range from upgrading people’s skills, to redesigning business practices, to significant infusions of technology, to fundamental changes of strategy. The scope of transformation can range from work activities, to business functions, to overall organizations, to the enterprise as a whole.”

The further the initiatives move from the center of framework, the greater the costs and risks will be. (Rouse, 2005b) further added that any “successful transformation requires consideration of all subordinate levels.”

How does the TOET relate to the issue of ICT adoption and implementation? The answer is simple. It has been illustrated that ICT have the ability to increase productivity, change the way people and enterprise communicate, create new knowledge streams, and develop new relationships. This has been exemplified in numerous case studies for ICT, such as enterprise resource planning (ERP), customer relationship management (CRM) or sales force automation (SFA) software. ICT have the ability to both enable and drive fundamental organizational change (Basole & DeMillo, 2006), but they also typically require substantial amounts of upfront investments. Using the analogy, of “driving the car, before writing the check," decision makers find it often critical to understand how ICT can aid, enhance, or add value to enterprises. Particular for ICT, whose potential transformational value and impact are poorly understood, it is even more pertinent to understand how organizational processes, culture, and relationships may change and where the impact of ICT adoption may be experienced the most. Proper identification, adoption and implementation of enterprise ICT are thus not only a strategic necessity, but also present a particularly difficult "challenge." The TOET thus provides a theoretical basis to understand how, and to a certain degree why, ICT transform enterprises. It enables us to understand what value deficiencies drive its adoption and implementation, what redesigned and/or new work processes emerge, how management must make its adoption decisions, and how social networks can influence them. Using the TOET as a foundation, we can investigate the transformational value and impact of ICT, in general, and mobile ICT in particular.

3.4. Research Implications

Today's organizations heavily depend on ICT for virtually all aspects of their operations. ICT have the ability to solve, but also create, business problems. They can create new opportunities, and enable organizations to become increasingly competitive. As ICT mature and new ones emerge, organizations will continue to adopt and implement them. The study of enterprise adoption of ICT is thus an important research issue to both practitioners and academics alike, which is reflected in the increasing attention given to it by a wide range of disciplines. The theoretical background and research synthesis presented in this chapter provide a comprehensive overview to the current state of the enterprise adoption research domain and present several important research implications.

3.4.1. Integration of Cross-Disciplinary Theories and Approaches

Enterprise adoption of ICT affects organizations in numerous ways. It enables organizations to create new competitive advantages and become more innovative. It can transform the way people interact and communicate, and often necessitates changes in organizational structure, processes, strategies, and culture.

These transformational impacts have been addressed in the literature predominantly with a single-discipline lens approach. IS researchers have focused solely on the impacts of ICT on organizations, but largely neglected the need to examine the influence of social factors, such as leadership and culture. Organizational theorists have studied the institutional and firm level forces that impact enterprise adoption decisions, but often ignored the capabilities of the ICT itself. The marketing and psychology literature has placed its research emphasis on understanding how users and individuals within organizations make adoption decisions. However, these studies in general did not consider the issues of organizational-level decisions that impact individual decision making. Economists tend to focus their enterprise adoption analysis at macro-levels, such as how organizations can create new core advantages and how ICT diffuse through the market.

This functional silo-syndrome has led to a plethora of different, but complementary approaches to the same problem. It has also led to use of a rich tapestry of theories and methodological approaches. Given the inherently cross-functional nature of enterprise adoption issues and to provide a holistic picture of the issue at hand, it is thus desirable to integrate theories and associated findings from the various disciplines and employ a cross-disciplinary lens to the study of enterprise adoption of ICT. This dissertation aims to address this issue by drawing from the literature base of multiple disciplines and provide a more integrative theoretical perspective.

3.4.2. Development of an Integrative ICT Adoption Model

Extending the previously discussed research implication of integrating cross-disciplinary theories and approaches, it is equally desirable to have a holistic framework that incorporates catalysts, factors, and moderators related to the ICT adoption decision. Most studies have contributed incrementally to the study of enterprise adoption decisions by investigating the influence of institutional, organizational, strategic, environmental, and technological factors. However, to the best of our knowledge, none of the studies have developed a holistic, integrated model of ICT adoption. Previous models simplified the overall decision by reducing the model to specific, parsimonious constructs and concepts, instead of providing a comprehensive picture. This is partially due to the particular research questions studies have attempted to address. Some studies are solely focused on the organizational characteristics, while others are only interested in cultural aspects of the adoption decision.

The lack of an integrative model is also due to methodological constraints. Most empirical studies require the development of validated instruments and constructs, thus often leaving out important factors that drive enterprise adoption. While methodological soundness of the study is important, it is also important to paint a comprehensive picture of the forces that shape enterprise adoption decisions.

This dissertation aims to address this issue by integrating salient, and empirically validated, factors that influence the enterprise adoption decision. In order to do so, this dissertation assumes a holistic perspective and draws from a multitude of theoretical and conceptual perspectives. There several benefits to develop an integrative model for both academics and practitioners alike.

An integrative ICT adoption model enables academics to identify potential gaps and missing elements in the adoption equation, and provides a conceptual basis for future studies. It also highlights what areas related to enterprise adoption have been emphasized and require further investigation.

From a practitioners' perspective an integrative view on enterprise adoption decisions generates an understanding of how various factors shape, impact and/or moderate enterprise adoption decision for ICT, in general, and mobile ICT in particular. Beyond this understanding, it can also facilitate the development of appropriate technology and innovation adoption strategies.

3.4.3. Investigation of Emerging and Disruptive ICT Adoption

The most prevalent gap in the literature and also one of the most salient research implications is the lack of investigation of emerging and disruptive (e/d) ICT. Most enterprise adoption studies have primarily focused their efforts on established and already well understood ICT, such as enterprise information systems (ERP, EDI, CRM), Web technologies, or the Internet. Relatively little research, however, has been conducted related to the issues surrounding the adoption of e/d ICT (Christensen, 2004).

Anecdotal evidence has shown that emerging ICT have a tremendous potential to fundamentally transform enterprises. The impact of e/d ICT ranges from simply reshaping business processes to changing entire industries. It can be applied as an enabler of cost reduction, increased resilience and security, and competitive advantage. Indeed, in today's economic and competitive environment e/d ICT have become a potentially critical asset to all types of enterprises, and not only to those that are seen as pioneers and early adopters.

The aim of this dissertation is to investigate whether traditional enterprise adoption models and frameworks can be directly applied to the context of e/d ICT. In particular, this dissertation will provide insight to the organizational implications and transformational impact of e/d ICT on business strategies, structures, and services. In doing so, this dissertation aids decision makers with the knowledge of how enterprises should approach their e/d ICT strategy and what processes can be put in place in order to identify and implement these solutions, to manage associated risks, and to maximize the return on their investment. Since there are numerous e/d ICT to the disposal of today's enterprises, this dissertation focuses on one particular type of e/d ICT, namely mobile ICT.

3.4.4. Development of a Decision-Analytic Model and Diagnostic Tool

The literature review and research synthesis highlighted another important research opportunity. Most studies employ either a conceptual, theoretical or empirical analysis approach to understanding the issues surrounding enterprise adoption of ICT. Since enterprise adoption of ICT can be considered a complex decision, a decision-analytic evaluation using multi-criteria decision making techniques may prove additionally insightful. However, only few studies have used a decision-analytic approach. This dissertation aims to fill this methodological gap.

Multi-Criteria Decision Analysis (MCDA) is a theoretically sound approach for making complex decisions under uncertainty (Keeney & Raiffa, 1993). It enables researchers to integrate diverse information, including results from scientific and engineering models, cost and benefit models, empirical data, and expert judgment. One significant advantage of a MCDA approach is its explicit separation of a decision problem into alternatives, information, and preferences. This, in theory, allows decision makers and stakeholders to separate “what we know” from “what we want”. Furthermore, its top-down, iterative framework prevents the analysis from becoming mired in more detail than is practicable. By starting with a simple problem formulation and using analysis to dictate where greater modeling effort and additional information should be focused, decision modeling is able to keep a tight rein on model complexity.

MCDA techniques are generally used in situations where multiple criteria are involved and confusion can arise if a logical, well-structured decision-making process is not followed. Enterprise adoption of e/d ICT presents one particular complex decision situation that could benefit from a MCDA approach. The goal of this dissertation is thus to first provide a high-level view of the decision space, in general, by mapping out critical decision criteria and their relationship, and second develop a hierarchical decision structure that breaks down the overall objective into its multi-level decision criteria. While a multi-criteria decision model can provide significant analytical insights, the development of a software diagnostic tool enables decision makers to generate “what-if” analyses that can aid in the decision making process. Drawing on the decision-analytical model as a theoretical bases, a third research objective is thus to develop a web-based diagnostic tool that guides the user through the decision space and facilitates the enterprise adoption decision.

3.5. Conclusion

Enterprise adoption of ICT is a very important, but inherently complex issue that decision makers face today. As ICT continue to evolve and are increasingly used to create and sustain competitive advantages, a solid understanding of the salient adoption and implementation criteria is of utmost significance. In order to lay the foundation for this dissertation, Chapter 3 provided a comprehensive review of the scholarly development of the enterprise adoption literature. Several important observations were made. First, there is a growing interest in investigating issues surrounding enterprise adoption of ICT from a wide range of disciplines. The field of information systems published the largest number of studies. This is not surprising as the issue of ICT adoption is largely dependent on the technology itself. A growing interest is also found in the organizational behavior, management, strategy, and innovation domains. As more enterprises realize the value and contribution of ICT to their overall business strategy, identification, adoption, and implementation of innovative technologies become an increasingly important decision.

In addition to a comprehensive research synthesis, this chapter also provided a review of some of the key theoretical foundations of enterprise adoption studies. In particular, this chapter reviewed theories of innovation diffusions, organizational innovation, process, institutions, enterprise transformation, and enterprise as systems. Together, these theories provide a comprehensive basis for explaining and describing factors that impact enterprise adoption decisions.

Based on the findings of the literature analysis and theory review, this chapter concluded with four important theoretical and practical research implications. First, the single-lens focus of enterprise adoption issues limits the explanatory power of existing models. Thus, an integration of different theoretical approaches is deemed important. Second, based on the various theories used to explain enterprise adoption, there is also an opportunity to develop a single, holistic model, which will provide a systematic view on the processes and factors involved in this complex decision. Third, despite the plethora of enterprise adoption studies, only a very small percentage has examined e/d ICT. Given the growing importance of e/d ICT is thus critical to examine whether existing models apply, and if not, how they can be modified or extended. Lastly, studies have limited their methodological approaches to either being conceptual, theoretical, or empirical in nature. However, given the inherent complexity of enterprise adoption decisions, it is found necessary to examine enterprise adoption issues using a decision-analytic approach. The following chapters examine each of these research implications in detail.

CHAPTER 4:

A MODEL OF COMPLEX ICT ADOPTION DECISIONS

4.1. Introduction

Despite a plethora of studies, there is still some uncertainty and debate about what actually drives and impacts enterprise adoption of ICT. Chapter 3 provides evidence that a multitude of disciplines have examined this research area, often from complementary, but in many cases also divergent views. In order to overcome both the theoretical and functional silo syndrome currently present in the literature, Chapter 4 aims to develop an integrative model of enterprise adoption of ICT by drawing on the rich set of literature

This chapter commences by synthesizing the literature for salient determinants of enterprise adoption of ICT. Expanding the basic technology-organization-environment (TOE) framework, we identify several additional factors that influence the adoption decision. Next, the chapter illustrates how enterprise adoption models have evolved over time and analyzes their shortcomings. Using process theory and the theory of enterprise transformation, this chapter then develops a stage model of the adoption decision. Chapter 4 concludes by describing the underlying concepts that drive enterprise adoption of ICT, identifying those not studied in traditional adoption models, and integrating them into a unified, conceptual model.

4.2. Determinants of Enterprise Adoption of ICT

Drawing on the extant literature on enterprise adoption of ICT and theories presented in Chapter 3, this section identifies the most salient determinants of enterprise adoption of ICT. They broadly fall into four categories, namely organizational determinants, leadership determinants, ICT determinants, and environmental determinants.[5] Environmental determinants are further decomposed into regulatory influences, social network influences, network externalities and competitive pressures, and vendor activity

4.2.1. Organizational Characteristics

Organizational characteristics are the most widely studied factors in enterprise adoption research. Since adopting new ICT may involve substantial efforts in development and has potentially significant impacts on enterprises, many organizational factors can be expected to influence the adoption decision (Daft, 1978). Expanding on the innovation diffusion and organizational innovation theories presented in Sections 3.3.2 and 3.3.3., seven organizational characteristics have been consistently shown to significantly influence the enterprise adoption decision (see Figure 20). These include (1) organizational size, (2) organizational structure, (3) organizational culture, (4) organizational resources, (5) compatibility, (6) ICT knowledge, and (7) organizational strategy.

[5] Since ICT implementations are only successful when they are infused into the organization and ultimately used by end-users, we only briefly review individual determinants that influence the enterprise adoption process (see Section 3.2.4). For a more complete review of individual adoption studies, the reader is referred to Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.

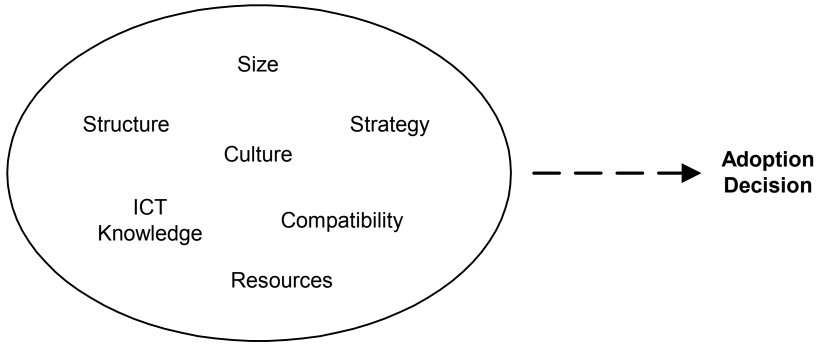


Figure 20. Organizational Characteristics Influencing the Adoption Decision

Organizational size has repeatedly been found to influence the propensity to adopt ICT (Gremillion, 1984; Damanpour, 1991; Premkumar, 2003; Laukkanen et al., 2005). Most commonly, organizational size is found to be positively related to ICT adoption. Previous studies argue that larger organizations generally experience more need to adopt new ICT in order to support or improve their activities and productivity (Yao, Xu, Liu, & Lu, 2002). Larger organizations also generally tend to have more financial resources at their disposal to pursue new ICT implementation opportunities. On the other hand, it is argued that smaller organizations are more flexible and innovative themselves, resulting in an enhanced receptiveness towards new ICT. With a growing commoditization of ICT and a rapid decline in acquisition and deployment costs, resources represent less significant constraints for ICT adoption. Indeed, with recent ICT advancements, smaller organizations are not required to implement large-scale solutions, but can adopt them on small scales as well. As a result, smaller organizations find it economically feasible to adopt new ICT capabilities to support their organizational activities (Yeung, Shim, & Lai, 2003; Grandon & Pearson, 2004a; Grandon & Pearson, 2004b).

Some studies argue that these mixed findings on the role of organizational size may be largely attributable to size's correlation with other organizational characteristics, such as structure, resources, strategy and culture (Meyer & Goes, 1988). (Kimberly & Evanisko, 1981) support this perspective and note that "the effects of size may depend upon the (study) context in question. A positive relationship between size and adoption behavior should (thus) not be (necessarily) assumed (pp.699-700)."

A second important organizational characteristic that has been shown to influence enterprise adoption of ICT is organizational structure. However, findings are mixed. Previous studies have suggested that organic organizations, characterized as dynamic, decentralized, and flexible entities, tend to adopt new ICT more readily than mechanistic (centralized and formal) ones (Daft, 1978). Two dimensions often applied to describe organizational structure are centralization and formalization (Decanio et al., 2000).

Centralization is the degree to which organizational power and control are concentrated in the hands of relatively few individuals (Decanio et al., 2000). (McGowan & Madey, 1998) suggested that a centralized structure facilitates faster, more efficient adoption of ICT than a decentralized structure because senior management can adopt innovations in spite of the resistance of lower level managers.

Formalization is the degree to which an organization emphasizes rules and procedures in the role performance of its members (Decanio et al., 2000). Previous studies have argued that high degrees of formalization could actually restrict ICT adoption by inhibiting exploration. However, other researchers (such as (Rai & Patnayakuni, 1996)) do not support this finding and suggest that the level of formalization has no impact on the adoption of ICT.

In contrast, recent studies have shown that flatter, less complex structures with maximum administrative decentralization, tend to create a potential for improved attitudes, more effective supervision and greater individual responsibility and initiative among employees. Organizations adopting such a philosophy are expected to be more flexible in accepting new ideas and innovations. Organizations of this kind are expected to have a higher (when compared to centralized organizations) tendency to adopt new ICT.

Similar to the argument for organizational size, it is thus important to determine the overall context of the study to determine how organizational structure influences the enterprise adoption decision.

A third organizational determinant of ICT adoption, and one often considered the critical social “glue”, is an organization’s culture. Organizational culture is defined as a set of shared values, beliefs, assumptions, perceptions, and norms (Sharma, 1994; Kitchell, 1995). (Boynton & Zmud, 1987) identified the importance of studying organizational culture in strategic ICT planning and noted that it can be a source of competitive advantage since it is valuable, rare, and unique for every organization. An organization’s culture positively inclined to ICT adoption is characterized by a high level of innovativeness and the ability to take risks, emphasis on growth and rewards, and team orientation (Boynton & Zmud, 1987). Organizational cultures that exhibit high innovativeness generally will have members who take more risks. The propensity to adopt ICT will therefore be higher in such organizations.

Building on the concept of organizational culture, organizational compatibility is another important facilitator of ICT adoption. Organizations are more likely to adopt new

ICT if they perceive it to be consistent with their culture, values, preferred work practices, and existing or desired IS infrastructure (Carlson, Kahn, & Rowe, 1999). Because the adoption of ICT, and in particular mobile ICT, often requires adopting organizations to modify existing business practices and processes to gain benefits, organizational compatibility can significantly impact the overall adoption decision. It is thus posited that there is a positive relationship between organizational compatibility and (mobile) ICT adoption.

Another critical organizational determinant in enterprise adoption of ICT is the availability of resources. Organizational resources pertinent to adoption of ICT include financial, human, and technical assets. Previous studies have shown that financial resources are particularly critical in the adoption and implementation of new ICT (Belassi & Fadlalla, 1998). ICT have the potential to significantly transform virtually all aspects of enterprises. Thus successful implementations and assimilation can often take a long period of time. Financial resources are required not only to initially implement, but also maintain ICT over their entire life-cycle. Similarly, the availability of human resources is important in the adoption of new ICT. Availability of ICT staff, consulting expertise, and training personnel aids in successful infusion of ICT. Technological resources are another organizational resource that can facilitate ICT adoption (Daft, 1978; Damanpour, 1991). The existence of a mature ICT infrastructure, based on open-standards and interfaces, for example, enables enterprises to more readily adopt and integrate new ICT (Basole & DeMillo, 2006).

Often considered an organizational resource, but considered a separate determinant, is the existence of organizational knowledge (McGowan & Madey, 1998; Armstrong &

Sambamurthy, 1999). Previous studies have shown that organizations tend to postpone ICT adoptions when not having adequate knowledge and skills necessary to conduct a smooth adoption process. On the other hand, organizations exhibiting general and ICT specific knowledge tend to be more adequately equipped (Dewar & Dutton, 1986). This is often attributed to the fact that the existence of organizational knowledge reduces knowledge barriers that occur with the introduction of new ICT (Nambisan & Wang, 2000). It also reduces the necessity to develop skills and knowledge required for successful implementations of ICT (Attewell, 1992). Organizational knowledge facilitates the overall adoption decision process, as decision makers can draw on previous organizational experience to make appropriate strategic choices.

A central determinant of enterprise adoption of ICT, and one that has received significant attention over the last few years, is an organization's strategy. An organization's strategy deals with how to make management's strategic vision for the company a reality and generally represents a game plan for moving the organization into an attractive business position and building a sustainable competitive advantage. In the context of ICT adoption, organizational strategy generally defines why, when, and how enterprises adopt and implement new ICT. Many case studies have shown that failure to invest in strategically important ICT could result in the loss of competitive advantage. Similarly, it has been shown that adoption of ICT can enable organizations to maintain or potentially gain or create new competitive advantages (Huff & Munro, 1985). Thus, an understanding of the potential value of ICT and an alignment to the organizational strategy is of critical importance.

Similar to Rogers' concept of adopter types (Rogers, 2003), (Mintzberg, 1994) and (Miles & Snow, 1978) suggested several different types of organizational strategies.

(Mintzberg, 1994) suggested three modes for organizational strategy-making: the entrepreneurial, the adaptive and the planning mode. In the entrepreneurial mode, organizational strategy is characterized by an active search for new ICT opportunities, power is centralized in the hands of leadership, dramatic forward leaps are made in the face of uncertainty, and growth is the dominant goal of the organization. The adaptive mode of strategy reflects a division of power among members of a complex system and clear goals do not exist. A solution to existing ICT problems is reactive rather than a proactive search for new opportunities. In the planning mode, assessment of the costs and benefits of competing ICT proposals is systematically analyzed, and decisions and strategies are integrated.

(Miles & Snow, 1978) suggested four types of competitive strategies: the prospector, the reactor, the defender and the analyzer. Integrating these two complementary typologies of organizational strategy, it is posited that a prospector organization is most compatible with the entrepreneurial mode of strategy making. Organizations of the prospector type value being "first in" in new product and market areas, respond rapidly to early signs of new ICT opportunities, even when some of their efforts do not prove to be highly profitable. In the reactor type, organizations take fewer risks than their competitors and generally respond only when forced to by institutional pressures. The defender can be depicted as a gray mid-range strategic type. These organizations look for relatively stable ICT opportunities and then strive to maintain them.

Applying these topologies to the context of ICT adoption, one can see how organizational strategies can impact the adoption decision. Indeed, several studies have utilized this approach and argued that prospectors tend to emphasize technological leadership and generally invest heavily in new ICT opportunities (Armstrong & Sambamurthy, 1999). Defenders on the other hand, are more conservative in their investment in ICT and focus on technological areas directly related to their line of business (Miles & Snow, 1978). They invest in new ICT only when they are convinced of their potential contribution to maintaining competitive advantage. Analyzers follow an intermediate strategy; they are more careful than the prospectors and decide upon investments in new ICT only after a thorough analysis of the possibilities and watching the actions taken by the leaders in their field (Miles & Snow, 1978).

4.2.2. Leadership Characteristics

A second category of determinants for enterprise adoption of ICT includes characteristics of leadership, or management in general. Most of the studies examining the influence of leadership characteristics on enterprise adoption originate in the strategic management and organizational behavior literature (Armstrong & Sambamurthy, 1999). While there is a long list of leadership characteristics that have been investigated in the context of organizational innovation, only a few have continuously shown to be significant factors of enterprise adoption decisions.[6] These include (1) support and commitment, (2) innovativeness, (3) visionary aptitude, and (4) previous experience.

[6] Two other leadership characteristics found to influence organizational innovation, but with mixed findings, include age and education.

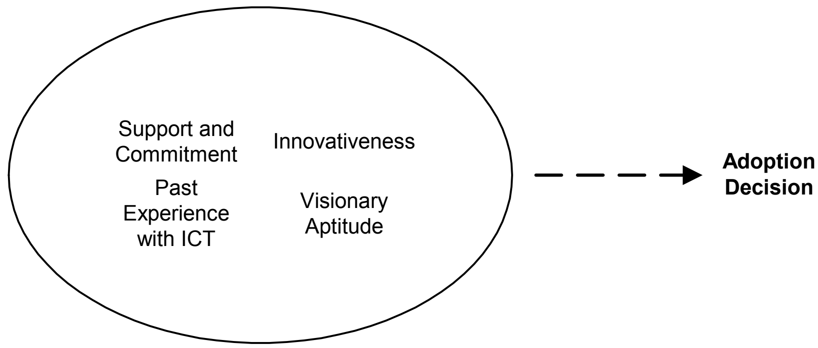


Figure 21. Leadership Characteristics Influencing the Adoption Decision

As in almost all innovative endeavors of an organization, top management support and commitment is an extremely important attribute. This is particularly true for ICT that are capable of transforming existing organizational procedures and relationships with partners and stakeholders. Top management support includes a commitment to support the technology at all levels of the organization and throughout the implementation process. Management support and commitment indicates to members of the organization that leadership approves, "believes" and encourages the use of the new ICT. Previous research indicates that top management support and commitment is generally a good predictor of success of new ICT implementations. Although there is evidence that the adoption of emerging ICT, such as mobile ICT is often driven by a "grass roots" (or bottom-up) movement, there is substantial evidence that without top management support and commitment, the ICT adoption and implementation process will stall or, in the worst case scenario, fail.

Another important leadership characteristic that drives enterprise adoption of ICT is the degree of innovativeness. Innovativeness refers to an individual's, in this case leadership, degree of taking on risks and being positively aligned with change. Leaders with high level of innovativeness tend to create an environment that embraces change and innovation, and project this attitude onto the entire organization. As such, innovative leader drive the adoption of emerging and new ICT.

Related to the innovativeness characteristic, is the level of visionary aptitude of leadership. Executives that tend to exhibit a visionary philosophy tend to create an environment conducive to ICT innovation and enable organizations to move towards successful implementations.

Lastly, previous studies have also shown that leaders that have had previous experience with ICT adoptions and implementations tend to be more prepared for new ICT and associated organizational change. (Barua & Lee, 1997; Sharma & Rai, 2003) note that previous experience enables leaders to prepare for issues that may arise and take appropriate courses of action if necessary.

4.2.3. ICT Characteristics

Based on Roger's work on the diffusion of innovations (see Section 3.3.2.), extensive research has been conducted in analyzing the impact of ICT characteristics on the adoption decision and extent of implementation in enterprises. Studies have utilized a multitude of different variables in assessing adoption and implementation, however most factors were ICT context dependent, making a synthesis of results often difficult. To resolve this issue, (Tornatzky & Klein, 1982) performed a meta-analysis on key articles to identify common ICT factors that motivate enterprise adoption. While Rogers' analysis had initially identified six salient factors, Tornatzky and Klein concluded that only compatibility, relative advantage, and complexity were relevant to adoption studies (Tornatzky & Klein, 1982). These factors were extended in recent studies to more overarching concepts and labeled as perceived benefits and costs, organizational fit, usefulness, and ease of use.

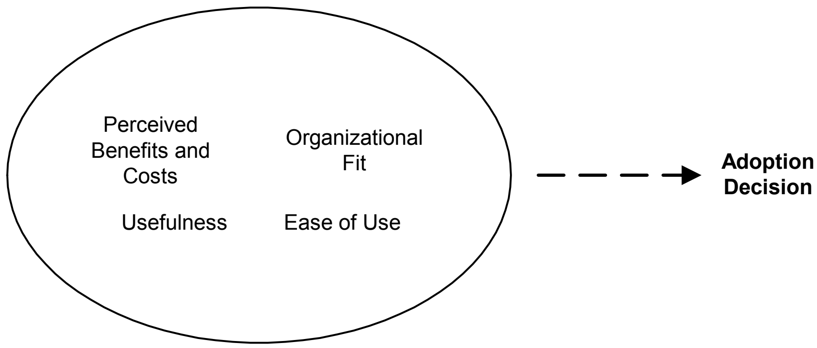


Figure 22. ICT Characteristics Influencing the Adoption Decision

Perceived benefits refer to the anticipated advantages that ICT can provide to the organization. Benefits can be of both direct and indirect nature. Direct benefits include operational cost savings and other internal efficiencies arising from, for example, reduced paperwork, data re-entry, and error rates. Likewise, indirect benefits are opportunities that emerge from the use of new ICT, such as improved customer service and the potential for process reengineering. Thus, the higher the perceived benefits of ICT, the more likely it is to adopt them.

Organizational fit is the degree to which ICT are consistent with the existing values, past experiences, needs as well as current and future activities of the potential adopters. Prior studies on ICT have found organizational fit, or compatibility, to be positively related to ICT adoption and diffusion (Chau & Hui, 2001; Chwelos et al., 2001).

The concepts of usefulness and ease of use come from Davis' Technology Acceptance Model . It posits that adopters tend to be more positive inclined to adopt ICT if they are pertinent to tasks or processes and are of low complexity. For a complete review of TAM studies and extensions, please refer to (Kautz & Pries-Heje, 1996).

4.2.4. Individual Characteristics

ICT that have to be incorporated in the work processes of organizational members are of little value if they are not used or complied with. ICT must be accepted by its target "user" group in order to realize the benefits the organization intends to gain (e.g. (Leonard-Barton & Deschamps, 1988; Premkumar, 2003)). Hence, it is important to assess the acceptance of ICT at the level of organizational members because if acceptance among the target group is lacking, the desired consequences can not be realized and the organization may eventually discontinue the ICT adoption process. There are many examples of ICT that only succeed with the acceptance of organizational members. Some specific cases are ICT for field force professionals, medical technologies for health care staff, and communication media (e.g. groupware) for R&D professionals. Drawing on theories from the innovation diffusion and organizational behavior literature, it has been shown that several individual characteristics influence the adoption decision (see Figure 23).

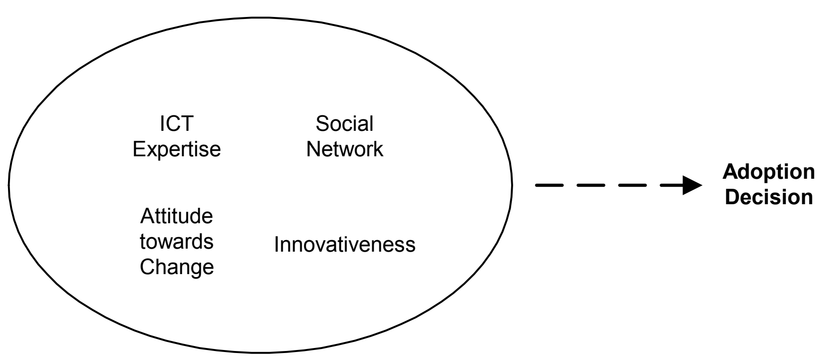


Figure 23. Individual Characteristics Influencing the Adoption Decision

A recurrent determinant in models explaining the individual acceptance of ICT, is that people's acceptance is based on their perceived beliefs and affects held towards the ICT (e.g. (Tornatzky & Klein, 1982; Thong & Yap, 1995; Rogers, 2003)). These cognitive beliefs and affects lead to an individual's attitude towards a particular ICT. There have been ample studies in the information systems literature that have shown that both cognitive and affective attitudinal factors are important in explaining subsequent ICT acceptance (e.g. (Raho et al., 1987)). The belief components incorporated in these models are very similar to the ones proposed in the innovation diffusion literature, discussed earlier. For example, 'relative advantage' is very similar to the conception of usefulness (Moore & Benbasat, 1991), while 'complexity' can be considered the inverse of ease of use. Building on Rogers' (1995) conceptualizations of perceived innovation characteristics, (Moore & Benbasat, 1991) identified additional innovation characteristics that seem especially relevant at the individual level. These include image – the perception that using an ICT will enhance social status – result demonstrability – the tangibility of the results of using the innovation – and visibility – the extent to which the innovation is perceived as visible in the adoption context.

Albeit the fact that an organization may try to influence its employees' attitudes towards favoring adoption of an innovation, some individuals readily accept certain innovations while others do not. Innovativeness refers to the disposition of an employee to accept any ICT. Further, "receptivity towards change" of organization's members has shown to be an important determinant of innovation success (Zmud, 1982). It can be expected that employees who are innovative, will exhibit more positive attitudes towards using new ICT. It has also been shown that innovativeness, and thus the decision to adopt new ICT, is determined by personal characteristics which are tied to a specific individual. Some examples of such variables are demographics, company and job tenure and previous experience.

The individual acceptance of ICT is also driven by the degree of innovation usage within the social environment of the individual (i.e. network externalities or peer usage). The influence of social usage may originate from two sources. First, network externalities may increase the value of the ICT. Many authors have emphasized the importance of a critical mass of users for the acceptance of ICT (e.g. Rogers 1995). The general rationale behind these network effects is that the utility of a networked ICT increases with the total number of users connected to the medium (e.g. fax, Internet, e-mail).

However, ICT usage by others in an individual's social environment is also important for ICT that do not possess interactivity. ICT usage of an employee's peers (e.g. superiors, colleagues, customers, etc.) may signal the importance and advantages of the ICT and motivate the individual to imitate and adopt the ICT. For example, if "important others" rely on mobile ICT for their decision-making, a focal individual may decide to comply in order to keep up with his peers.

In addition to organizational, ICT, and individual determinants, the business environment of an organization may also influence its adoption behavior in different ways (see Figure 24). First, an organization may be influenced by the social network it is embedded in. In other words, an organization may derive an intrinsic utility from the fact that business partners within their network have previously adopted the innovation (i.e. network externalities). Competitive pressures and vendor activities may also incite adoption. More recently, regulatory influences have determined the speed and rate of enterprises adopting new ICT. These environmental influences are discussed next.

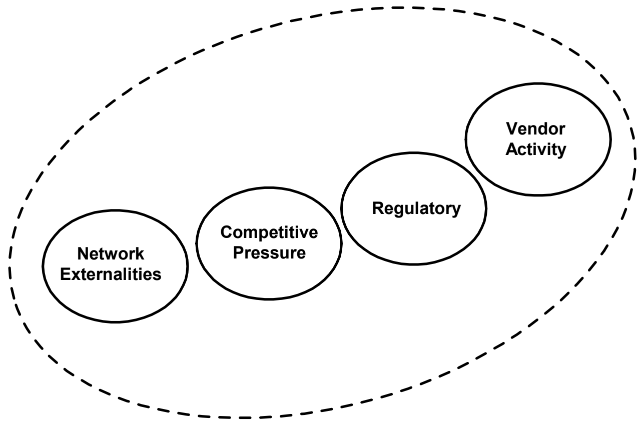


Figure 24. Environmental Factors Influencing the Adoption Decision

4.2.5. Network Externalities

Using the theory of enterprises as systems (Rouse, 2005a), it is also important to consider the influences of the social network of an organization when understanding the process of ICT adoption. The interaction, in terms of frequency and richness, between members of a social system (network participation) has been shown to significantly enhance the speed and rate of ICT adoption (Zaltman et al., 1973; Bhattacherjee, 1998).

Organizations may adopt new ICT based on the number of other interrelated organizations in the market environment that have adopted the focal ICT. In the literature these external contingencies have been theorized as the concept of network externalities or critical mass (e.g., Markus 1990; Rogers 1991; Katz and Shapiro 1994; Kraut et al. 1998). Briefly, the theory of network externalities claims that the value of the focal ICT and, hence, its adoption probability, is intrinsically determined by the number of other users. In the case of organizational ICT adoption, positive network externalities exist when the intrinsic utility of an innovation increases when a firm's suppliers, customers or other organizations (e.g. government) also use the innovation. For example, information systems investments (e.g. extranets, EDI, and mobile ICT) may generate greater value and gain importance once a sufficient degree of these business partners rely upon these systems as well.

4.2.6. Competitive Pressures

The type of competition an organization faces influences the extent of ICT adoption. In his seminal work, (Porter, 1980) identified five competitive forces: rivalry among competing firms in the industry, the threat of new entrants, threat of substitute products or services, the bargaining power of suppliers and the bargaining power of customers. In the current competitive environment, ICT offer a unique opportunity for organizations to gain competitive advantage. Factors such as the decline in the cost of supporting ICT, and structural changes in the economy caused by global competition have increased the external use of ICT as competitive weapons. As competition increases within an industry, organizations may find themselves investing in ICT to achieve cost efficiencies. For example, if a pharmaceutical company mobilizes its field force, it may be able to provide real-time information to the point-of-action, thus attaining sales efficiency. This may force other companies in the same industry to make mobile ICT investments of their own.

Non-adoption of ICT that is adopted by others in today's global environment may result in competitive disadvantage for the focal organization. This, of course, depends on the strategic importance of the ICT and its potential implications for the effectiveness and efficiency of the organization's activities.

4.2.7. Regulatory Influences

In some instances, enterprise adoption of ICT is also influenced by regulatory policies set forth by the government in the country in which the organization operates. Such policies are often used to establish trade policies and tax incentives to accelerate ICT adoption. These policies can be considered to be of two types: government promotion (e.g. financial incentives and procurement requirements) and legislation barriers (e.g. taxation of sales, business laws for ICT-enabled commerce and legal protection for Internet purchases).

4.2.8. Vendor Activity

Only little research has been conducted within the IS discipline to explore the impact of vendor actions on ICT adoptions and implementations. Instead, most vendor action research has been conducted within the field of marketing evaluating how vendor strategies can promote new products to potential customers. These studies have in particular explored the relationship between consumer behavior and marketing action, suggesting that vendor involvement can significantly contribute to the rate of adoption and diffusion of new ICT. Vendor activity can significantly influence the probability that ICT will be adopted by organizations (Frambach, 1993). (Brown & Lockett, 2004), for example, proposed that vendor actions, such as providing a supporting ICT infrastructure, price reduction, and product promotion, can result in an increase in the rate of adoption.

Another important role is played by the launch strategy that is applied by the vendor. Although different marketing variables may stimulate or facilitate ICT adoption, three main factors have been shown to significantly affect adoption probability, i.e. the targeting of ICT, the communication on ICT, and the activities the vendor undertakes to reduce the risk of adoption for the potential customer.

Careful and specific targeting of the innovation towards selected potential adopters can facilitate acceptance in the market. Potential adopters such as innovative organizations and individuals, heavy users of the product category, or heavy users of the preceding ICT may be more receptive to the technology than others. Also, targeting potential adopters that in any other way may (economically) benefit from adopting the innovation obviously can be beneficial.

As ICT adoption is largely an information processing activity (Rogers 1995), vendor communication activities on ICT will not only create awareness of the ICT, a pre-requisite for entering further stages of the adoption process (see Section 4.4.), it also influences the potential adopter's perceptions of the innovation.

By reducing risks associated with early adoption of ICT, such as implementation risk, financial risk and operation risk, the adoption of an emerging ICT can also be stimulated (Frambach, 1993). The new ICT may be given on trial to an organization for a certain period of time (Robertson & Gatignon, 1986) or the vendor may decide to absorb major risks of adoption by offering the potential adopter the ICT at a low introduction price (Srinivasan et al., 2002).

Lastly, another significant vendor involvement that could have a strong impact is the provision of effective training. Take the case of mobile ICT. Since mobile ICT is an emerging technology that may result in new ways of doing work, the provision and adequacy of training is deemed to be a major concern in its implementation. Among all the available approaches, vendor training is considered to be the most effective, especially when the technology is still relatively unknown.

4.3. A Theoretical and Conceptual Evolution of ICT Adoption Models

The scholarly development of ICT adoption models has largely been driven by the incremental addition of various determinants identified in the previous section. Initial models built their theoretical foundation on innovation diffusion theory and the literature on organizational innovation. As interest in enterprise adoption studies increased and existing models failed to explain certain phenomena, researchers incorporated theoretical approaches from complementary research streams. Over time, ICT adoption models have become much more elaborate and examine the adoption decision issues from a wide variety of perspectives. This section provides a broad overview to the theoretical and conceptual evolution of ICT adoption models and discusses their shortcomings.

Early ICT adoption models investigated the interplay between organizational and technological factors (see Figure 25). These studies were interested in what organizational conditions and technological characteristics would lead to enterprise adoption and implementation.

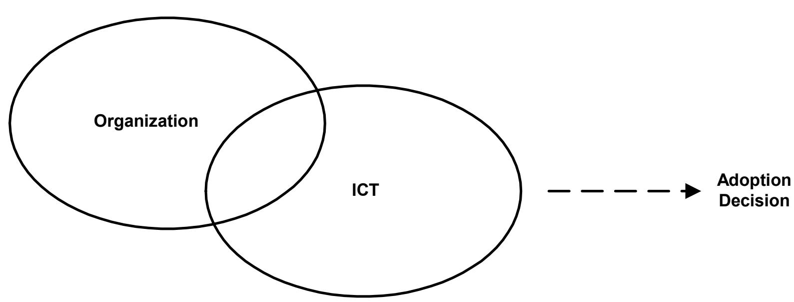


Figure 25. ICT Adoption Models (I)

Since ICT are primarily used by individuals, and successful adoption of ICT is largely dependent on the infusion and continued use by end-users, individual (end-user) characteristics were increasingly integrated into the next stage of enterprise adoption models (see Figure 26). These models examined how individuals impacted the enterprise adoption decision and what organizational conditions would facilitate successful infusion of new ICT.

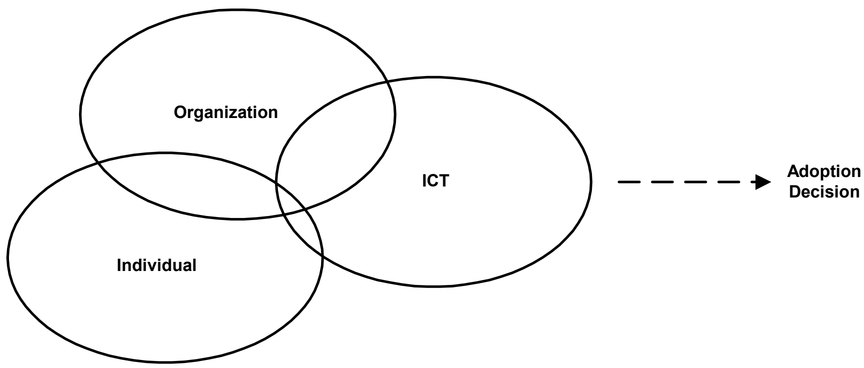


Figure 26. ICT Adoption Models (II)

The growing importance of leadership and managerial strategies led to the development of another class of enterprise adoption models. In this class, the interplay between organizational, technological, and individual factors in conjunction with leadership determinants were examined in their influence on enterprise adoption decisions (see Figure 27). Theories from the strategic management and organizational behavior literature formed the basis for these types of models.

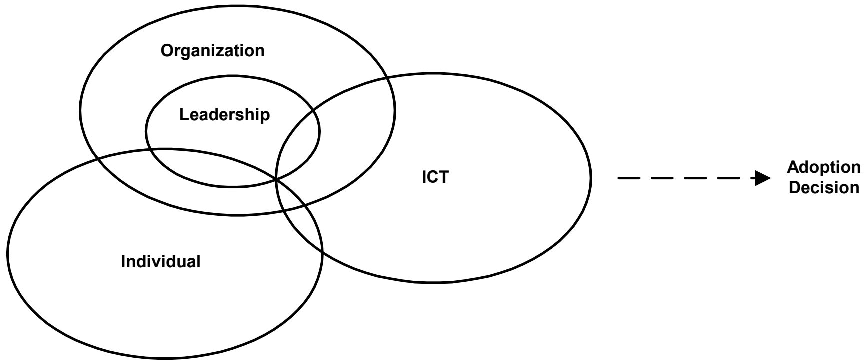


Figure 27. ICT Adoption Models (III)

Based on the concept of enterprises as system and institutional theory, the impact of environmental factors was increasingly studied (see Figure 28). Particularly the examination of competitive pressures and network externalities formed the core of most institutional studies. Drawing on economics, public policy and marketing literature, subsequent studies investigated how other external conditions could facilitate and motivate the adoption of ICT. These particularly included regulatory influences and vendor activity.

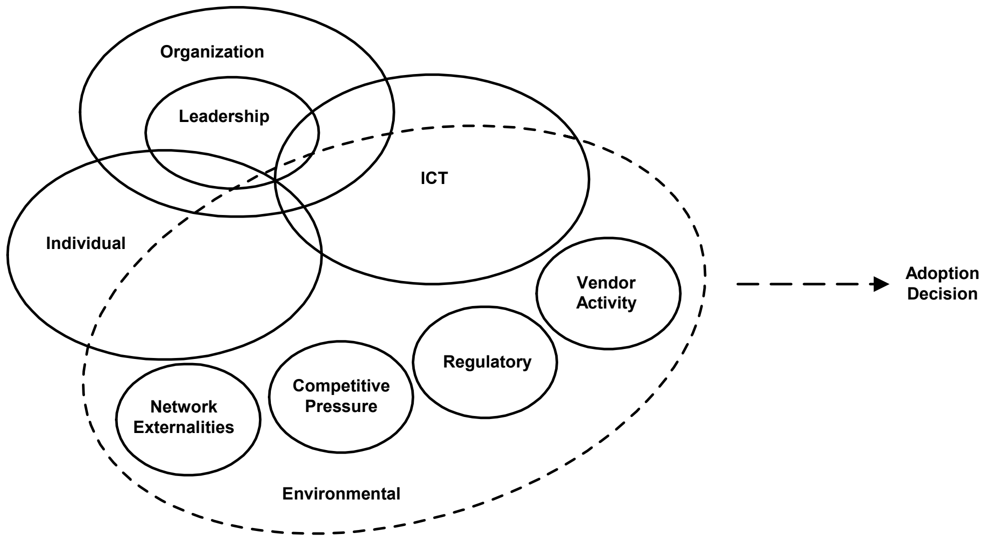


Figure 28. ICT Adoption Models (IV)

Despite the tremendous evolution of ICT adoption models, only few studies have used a holistic approach. A commonly cited shortcoming of each of the aforementioned intermediate models is their lack of integration of salient determinants. Most studies use a piece-meal approach and examine only one particular or interaction between model segments. In order to receive a comprehensive understanding of what drives and inhibits enterprise adoption of ICT, all aspects must therefore be considered.

Another key weakness of these factor-model approaches is the lack of understanding of how adoptions and implementations progress over time. A factor approach tends to assume a static view of the adoption decision. However, most enterprise adoptions of ICT are an iterative and interactive approach that continuously changes. Thus, a process, or stage-model approach is deemed important.

4.4. Stages of ICT Adoption

Process theory (see Section 3.3.5) suggests that the process of ICT introduction into the organization tends to occur in a series of stages. In its most broad conceptualization, two main stages were identified, namely initiation and implementation. The actual adoption decision occurs between these two stages. Since the objective of this dissertation is to understand how and why enterprises adopt ICT, we will focus our research efforts on the initiation stage. Figure 29 breaks down the initiation process into several sub-stages. These are explained in detail as follows.

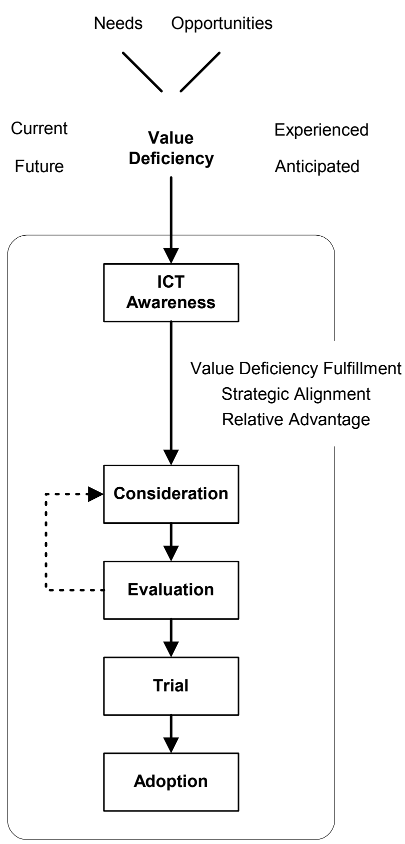


Figure 29. Stage Model of the ICT Adoption Process

The adoption of new ICT is often triggered by internal or external catalysts. Using the TOET as our scholarly basis, we argue that adoption of new ICT is in fact driven by experienced and/or anticipated value deficiencies. In other words, enterprises recognize that there is a need or opportunity to adopt ICT that could potentially address and resolve their value deficiencies.

Successful ICT decision makers are cognizant, or aware, of what new ICT are available in the market that can address their experienced or anticipated value deficiencies. There are several sources that contribute to awareness creation for ICT. Most commonly identified sources include trade journals, vendor marketing, and word-of-mouth. Trade journals tend to report on the emergence of new and innovative products and technologies in a more informative manner (Wind & Mahajan, 1987). ICT decision makers often attend and participate in trade shows to gain additional insight to the capabilities and functionalities of potential ICT. Vendor marketing efforts is another important stream for generating awareness of ICT capabilities. These are generally in the form of presentations and seminars, and tend to be educational in nature. Word-of-mouth is another significant source for creating ICT awareness and generally tends to occur in indirect and/or informal ways.

In order for a particular ICT to be considered for adoption, it must generally meet several criteria. First, it must in some ways present a business value to the organization and address either current and/or future needs. Depending on the requirements, several ICT might be able to meet these needs. Given several ICT options, compatibility with existing infrastructure, relative cost, and strategic alignment are thus additional essential decision criteria. The timing of ICT adoption and implementation is also an important factor. If it is perceived that implementation can wait for the arrival of a new ICT, or current and future value deficiencies are not served, ICT adoptions are generally deferred. Along the same lines, adoption may be deferred if a critical mass is not present. However, even if a critical mass is required for the broad diffusion of ICT, adopters are some times willing to accept ICT at early stages if they believe a relative advantage over current solutions exists (Rogers, 2003).

The evaluation stage is characterized by creating a simulated environment where the value deficiency (or needs) is addressed with the potential new ICT. Product evaluations in trade journals tend to influence the predisposition of the evaluators. The evaluation stage helps to expose implementation issues and problems early, particularly when results do not match user expectations. If the benefits sought are not demonstrated during the evaluation, another ICT from the consideration set is selected for further evaluation.

The trial stage is considered a limited deployment of the selected ICT. It necessitates a successful evaluation process in order to introduce it into the organization with real users and applications. The purpose of the ICT trial is to test its suitability with a particular user segment prior to widespread adoption and implementation. It reduces buying and implementation risk, as a minimal trial deployment can further expose issues that were not identified during the evaluation stage. After successful evaluation and trial, decision makers then make the final adoption decision.

4.5. An Integrative ICT Adoption Model

4.5.1. Overview

Both factor and stage modeling approaches have provided significant insight into the determinants and processes of enterprise adoption of ICT. Subsequent studies generally tend to utilize one of the two approaches. Only few studies have integrated the two approaches into a single framework (Frambach, 1993), due to methodological limitations. Nevertheless, it is important to realize that both approaches are critical for a comprehensive understanding of enterprise ICT adoption.

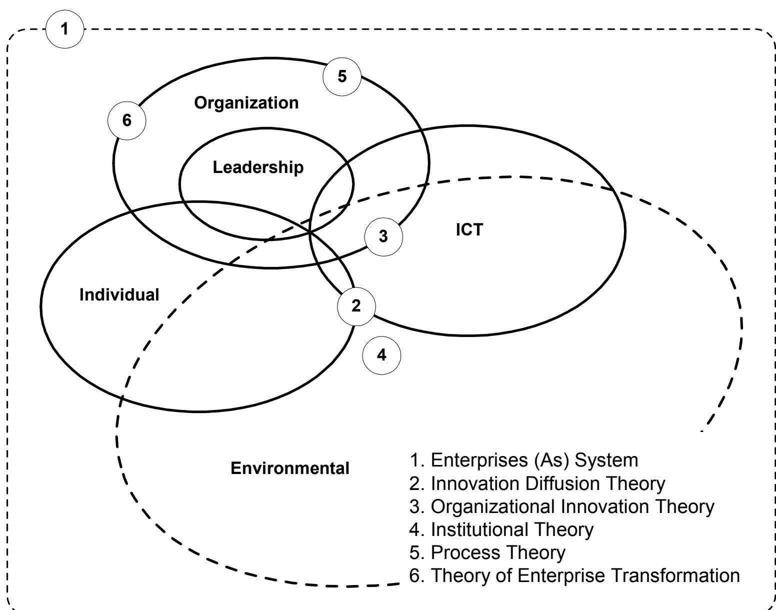


Figure 30. Theoretical Foundations of the Integrative ICT Adoption Model

Although traditional factor and stage modeling approaches have provided a good basis for subsequent studies of enterprise adoption, a shortcoming of these types of models is their inherent weakness for practical decision making (Gallivan, 2001). While it is important to understand and be aware of specific determinants and stages of enterprise adoption of ICT, practitioners tend to prefer a comprehensive decision modeling approach that can aid in complex ICT decisions.

The purpose of this section is thus to integrate the findings into an overarching conceptual decision framework that can provide a basis for a practical decision support tool. In order to do so, we draw on the theories and determinants presented in the previous and current chapter (see Figure 30).

Only a few years ago, ICT leaders endured tremendous pressure to get the job done at any cost. However with significantly reduced ICT budgets and increasingly uncertain economic times, this "at any cost" mentality has shifted to a more cost, impact, and bottom-line driven approach. Today, ICT decision makers must justify why an organization should consider adopting new ICT, assess whether it is worth making potentially substantial investments, determine how it fits within the current and future strategy of the organization, evaluate associated risks, and understand whether the organization is prepared to embrace it.

All of these issues are often present in complex investment decisions. Indeed, (Ward & Peppard, 2002) argues that enterprise adoption of ICT can be broadly considered a complex, strategic investment decision. As such enterprise adoption of ICT requires an evaluation of numerous quantitative and qualitative issues. Using the determinants and processes identified in this chapter as a theoretical basis and anecdotal evidence from the management literature, we argue that enterprise adoption decisions are composed of four major decision criteria. These include (1) the business value of the focal ICT, (2) the cost and economics associated with ICT implementation, (3) the strategic alignment of the focal ICT, and (4) enterprise readiness for ICT. All of these criteria must be considered within the contextual situation the ICT is being adopted in. In addition, risk and uncertainty associated with each of these decision elements must be taken into consideration. The integrated ICT adoption decision model is shown in Figure 31 and discussed in detail in the remainder of this section.

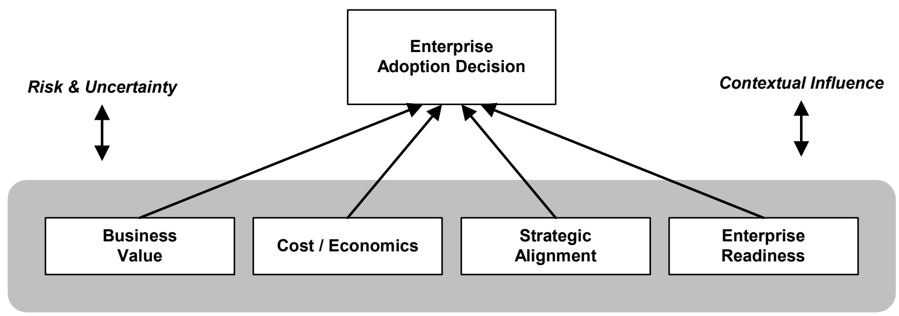


Figure 31. An Integrative ICT Adoption Model

4.5.2. Business Value of ICT

A recent article by Nicholas Carr entitled "Why IT doesn't matter" in the Harvard Business Review (Carr, 2003) attracted considerable attention. Carr argued that even as the power and presence of ICT has grown, its strategic importance has decreased. ICT is necessary for competitiveness, but insufficient for competitive advantage. Many respondents have critiqued his perspective. Their general counterargument is that despite the hypothesized "productivity paradox", ICT has enabled organizations to become more efficient, deliver new products and services, and create and sustain new advantages (Ward & Peppard, 2002).

This controversial debate however raises a good point: evaluating the business value of ICT is not as simple as it seems. Based on the strategic management, information systems, and organizational behavior literature, previous research seems to agree that business value of ICT should be assessed along multiple dimensions. Synthesizing the extant literature on business value of ICT (Barua, Kriebel, & Mukhopadhyay, 1995), we suggest that business value of ICT must be assessed by what type of benefit the focal ICT can provide, where the value is realized, and when the value can be achieved.

In their seminal work, (DeLone & McLean, 1992) measured the value of ICT as the benefit or impact it will have on organizations. (Mirani & Lederer, 1998) and (Martinsons, Davidson, & Tse, 1999) extended this conceptualization, and argued that business value is defined as the overarching measure of experiencing strategic, information, and transactional benefits. In a recent market research study, these findings were confirmed. Business value of ICT can be defined as the overarching measure of different types of benefits. However, instead of three categories, we argue that organizations can realize four types of benefits — informational benefits, strategic benefits, transactional benefits and enterprise transformation benefits (see Table 16).

Table 16. Types of Benefits of ICT

Type of Benefit	Details
Strategic Benefits	Strategic benefits include the ability to create competitive advantage, align business strategies to directly support organizational goals, provide new products or services, and improve relationships with customers.
Informational Benefits	Informational benefits include faster and easier access to internal and external information, more useful, accurate and reliable information, and increased flexibility for manipulation of content and format of information.
Transactional Benefits	Transactional benefits include operational and cost savings, supply chain management savings, staff cost savings, and improved business efficiency of employees, business processes, and financial resources.
Enterprise Transformation	Benefits associated with enterprise transformation include improved skill levels, new business plans and business models, expanded capabilities, and improved structure and processes.
Business Value of ICT	An overarching indicator of the value of ICT to the organization, which combines strategic benefits, informational benefits, transactional benefits and enterprise transformation benefits.

In addition to the four types of benefit described above, our analysis argues that we can synthesize these types into one overarching concept of business value. It is defined as the extent to which an organization receives business value from ICT. While most studies have attempted to operationalize the business value with economic and financial measures, we assume that business value is a combination of both tangible and intangible metrics, thus taking into account the aforementioned types of benefits. In particular, we argue that business value for ICT can be measured by the extent with which decision makers agree that the adoption and implementation of ICT will contribute to each benefit type. That is, a higher business value means that decision makers more strongly agree that benefits will be achieved.

Since most ICT investments are under extreme scrutiny today, understanding and justifying the business value is critical. Based on our discussion above, we thus propose business value to be one of the central elements of the integrated adoption decision model.

4.5.3. The Cost and Economics of ICT Adoption

The costs and economics associated with ICT implementation projects are another important aspect of the overall technology adoption decision. Organizations planning to adopt ICT must not only consider the tangible and intangible benefits derived from adoption, but also justify the costs associated with its successful implementation. Generally, the larger and more complex the scope and scale of the ICT initiative, the more resources must be deployed. Naturally, this leads to higher costs.

However, organizations often underestimate the true costs/economics of ICT adoption and implementation projects. Often, decision makers merely include direct IT costs, such as the costs associated with the installation and configuration of hardware and software. However, indirect costs are also significant contributors. For example, indirect costs can arise from the transformation of existing to new work practices. At first, a temporary loss in productivity may be experienced. Additional costs may be experienced once the basic functions of the new ICT are in place. Training of employees must be provided. Costs can also increase when members of the company resist the change. As such, enterprise transformation through ICT can become increasingly expensive

On the flip side, organization must also calculate the costs, or potential loss, of not implementing new ICT. By foregoing the implementation and adoption of an ICT, decision makers may face severe consequences. Competition may become more fierce; organizations may lose valuable customers; the supply chain may become inefficient; or the corporate image is tainted as consumer do not see the organization as a technological leader.

The costs and economics element of the ICT adoption decision is therefore also very critical. Careful assessment of costs can lead to greater buy-in by senior management and much more successful adoptions. Several assessment models have been used to determine the economic value and costs associated with ICT investments. Traditionally, models have been based on net present value methods. More recently, decision makers have used options-based framework to evaluate ICT investments. The latter approach allows decision makers to incorporate risk and uncertainty into the modeling process, thus reflecting reality more accurately.

4.5.4. Strategic Alignment of ICT

The third element of the integrated adoption model is the strategic alignment of ICT with business objectives. Strategic alignment of business and ICT has been a topic of great interest in recent times (Hartman & Sifonis, 2000; Kaplan & Norton, 2004). Organizations considering the adoption and implementation of new ICT must evaluate how ICT will impact the overall strategy. Recent studies have shown that an alignment between business strategy and ICT is essential, particularly in times of organizational change and uncertain economic conditions. Indeed, strategic alignment of ICT and business is considered a key aspect in information systems planning and has become a central responsibility of the CIO. More recently, it has been argued that strategic alignment is particularly important when considering emerging ICT (Passerini & Patten, 2005). If the emerging ICT under consideration does not fit with the long-term goals and objectives of the organization, it is likely that the organization will not benefit significantly from adopting it. Also, the adoption and implementation of an ICT that is not aligned with the business strategy will steer organizations away from their intended course.

4.5.5. Enterprise Readiness

The first three elements of the adoption decision describe the essence of business value, costs, and strategic alignment when considering mobile ICT. However, one element that we found was relatively unexplored in the literature was enterprise readiness. Enterprise readiness represents an organization's preparedness to adopt and implement new ICT. Even if the business value is there, the costs make sense, and mobile ICT aligns well with the overall business strategy, it would not be wise to pursue adoption if the enterprise is not ready for it. In fact, many ICT implementations have failed due to a lack of enterprise readiness. While economists may argue that enterprise readiness for ICT can be considered as part of the cost/benefit equation, we believe that enterprise readiness is a much deeper concept and deserves focused attention. In traditional cost/benefits models tend to subsume costs into one large element; we tend to argue that enterprise readiness consists of multiple dimensions.

The assessment of enterprise readiness enables executives and decision makers to identify organizational deficiencies, make appropriate changes and improvement, thus reducing the risk associated with mobile ICT implementation. We therefore believe that enterprise readiness is a critical element in the ICT adoption decision

4.5.6. Contextual Determinants

No ICT decisions can be made in isolation. Decisions must be considered within the context they are carried out in. In Chapters 3 and 4, we highlighted several contextual factors that influence the adoption decision. Among these are organizational factors (such as size, structure, and leadership), environmental and institutional factors (industry, competitors, vendor influence, regulatory pressure, partners and suppliers), and technological factors (maturity, availability). All of the aforementioned decision elements – business value, strategic alignment, enterprise readiness, and costs/economics – must thus be considered under a contextual lens. For a more detailed description of contextual determinants, please refer to Section 3.3.3. and Sections 4.2.5 – 4.2.8.

4.5.7. Risk and Uncertainty

While context is clearly an overarching factor in the adoption decision, risk and uncertainty is also a factor that shapes the enterprise adoption decision. Today's business environment is more dynamic and competitive than ever. Industries are more volatile, ICT are changing rapidly, old business models are suspect, new business models are often unproven, and everything happens much faster. Nevertheless, organizations must still operate as efficiently and effectively as possible, meeting customer requirements, dealing with partners and suppliers, and serving internal needs.

Particularly when enterprises are considering the adoption and implementation of a new ICT that can fundamentally transform their organization, a significant amount of risk and uncertainty is involved. Most studies have considered ICT adoption from a deterministic perspective; however, it is well known in practice that the future is inherently uncertain, and that ICT adoption and implementation outcomes can not be predicted with certainty. Common questions associated with ICT implementations include: Will organizations in fact realize the proposed benefits? What will the real value be? How long will the implementation process take? How will changing contextual factors influence the adoption decision? These uncertainties are further amplified when the ICT under consideration is not well understood as is the case with mobile ICT. It is therefore very important to provide management with means to make strategic choices and manage risk in the face of uncertainty when it comes to complex, enterprise-wide ICT adoption decisions.

We therefore include risk and uncertainty in our integrative ICT adoption model. In fact, risk and uncertainty is inherently embedded in all of the aforementioned adoption decision elements: it can be found with respect to the business value of mobile ICT; it can be found in the costs and economics associated with the adoption and implementation; it can be identified in the adoption and implementation context. Reducing risk and managing uncertainty is therefore a very important aspect in successful ICT planning.

4.6. Summary

Chapter 4 discusses what determinants influence enterprise adoption decisions; how enterprise adoption models have evolved over time; what stages decision makers tend to go through in adoption decisions; and how these findings can be integrated into a unified enterprise adoption model.

Given the plethora of influencing factors, it is not a surprise that enterprise adoption decisions are considered inherently complex. Using the theoretical backdrop identified in Chapter 3, we determined that enterprise adoption decisions are primarily a function of the business value of the ICT under consideration, costs/economics associated with it, alignment of ICT and business strategy, and enterprise readiness – all influenced by contextual determinants and risk and uncertainty. It is clear that organizations would seldom invest just because they are ready. However, if an organization invested because of the other first three elements and the organizations was not ready, the value of the investment would likely be diminished. The first three decision elements have received considerable attention in the literature, but only little research has been done to understand and determine the underlying dimensions of enterprise readiness. In the next chapters, we therefore explore and empirically validate this novel concept in further depth.

CHAPTER 5:

ENTERPRISE READINESS FOR MOBILE ICT

5.1. Introduction

In Chapter 4, we identified enterprise readiness as an important element in the overall enterprise adoption decision of ICT. Most existing readiness frameworks and models have focused on the economic or individual level of analysis. Enterprise readiness has received little or no attention despite its strategic importance. Some studies have used a balanced scorecard approach to assess strategic readiness (Kaplan & Norton, 2004). Others have used a checklist-type of an approach to determine organizational technology readiness (Karandikar, Fotta, Lawson, & Wood, 1993; Snyder-Halpern, 2001; Jutla, Bodorik, & Dhaliwal, 2002; Ruikar, Anumba, & Carrillo, 2006). To the best of our knowledge, none of the studies, however, have examined enterprise readiness in a holistic manner. Given shrinking ICT budgets and a smaller tolerance for implementation failure, an assessment of enterprise readiness for ICT is deemed an important precursor to successful ICT adoption. In order to fill this theoretical gap and provide a practical contribution, this chapter draws on the literature and theory identified in Chapter 3, and explores and develops the concept of enterprise readiness for ICT, and mobile ICT in particular. To set the motivational stage and provide a backdrop for our theoretical contribution, this chapter also highlights the critical need for readiness assessment and reviews existing readiness assessment models. This chapter then provides a dual perspective on how our framework of enterprise readiness can be applied by academics and practitioners for organizational self-assessment and potential-client/customer identification.

The focus of this chapter then shifts to the development of our conceptual framework of enterprise readiness for mobile ICT. It is proposed that enterprise readiness consists of eight dimensions. Each readiness dimension can be assessed with numerous assessment indicators. Both readiness dimensions and associated assessment indicators are described in detail; corresponding hypothesis are also provided. Chapter 5 concludes with a summary of the salient ideas of enterprise readiness for mobile ICT and suggests necessary empirical research avenues.

5.1.1. The Need for Readiness Assessment

As we identified in Chapter 3, prior research studied key factors for ICT adoption and implementation. (Barua et al., 1995), for example, suggested that before implementing ICT, and e-business solutions in particular, executives and senior managers must understand the nature of the ICT, business processes, and overall readiness along their business value chain. Similarly, (Agarwal & Tanniru, 1992) posit that a proper technology strategy and plan is often a key factor for successful adoption and implementation of ICT solutions. As part of the technology strategy, organizations should be able to identify opportunities for new ICT, identify current strengths and weaknesses of their ICT, develop an appropriate ICT budget, evaluate ICT investments, and analyze current trends within the industry, and appropriately skill and develop their workforce (Ward & Peppard, 2002). These aspects highlight that an ICT adoption and implementation plan is often an indispensable part of an organization's overall strategy. It also highlights the importance of an organization's complete understanding and assessment of their strengths and weaknesses before making complex ICT adoption decisions.

As ICT budgets have decreased and failure rates for new ICT implementations have continued to rise over the past years, a smaller tolerance to ICT failures has emerged. The hype of potential benefits often drives enterprises to jump onto the "fad" bandwagon and rush into ineffective implementations of new ICT (Abrahamson, 1991). In contrast, however, a range of studies have shown that many potentially successful IT projects fail due to a lack of assessment of potential barriers and organizational risks associated with the implementation of new ICT (Scott & Vessey, 2002).

In order to minimize the associated risks and maximize the potential benefits of enterprise mobility solutions, organizations must thus not only understand the value and economics of enterprise mobility solutions, but also carefully evaluate and measure their level of "enterprise readiness" for mobile ICT (Hartman & Sifonis, 2000; Basole, 2005). Readiness assessment enables decision makers to become more knowledgeable about the characteristics of mobile ICT, form attitudes about it, and make a decision regarding the fit between the technology and the organization (Hartman & Sifonis, 2000). It also enables decision makers to determine whether enterprises can truly benefit from mobile ICT and take appropriate measures to steer the organization towards a successful adoption and mobile transformation transition (Passerini & Patten, 2005).

Using the metaphor of health, enterprise readiness can be viewed as an organization's "fitness" to pursue ICT adoption. Consider the ambition of a mountain climber. A mountain climber may see a tremendous value to climb and conquer Mount Everest (business value); the expedition is justified from a cost perspective (cost/economics); and it aligns with his or her personal goals (strategic alignment).

However, he or she may not be healthy or fit enough (enterprise readiness) to pursue such a complex, difficult, and challenging endeavor.

Enterprise adoption of ICT can therefore be compared to the ambition of the mountain climber to climb a mountain. The higher the "fitness" level of the mountain climber, the more efficiently and easier he or she can climb up the mountain. Similarly, an enterprise that is more ready, can more effectively and efficiently adopt and implement ICT. The objective is thus not to understand how much readiness an organization needs, but to explore the nature of readiness itself.

As more and more enterprises realize the value and impact of mobile ICT, there is thus a growing need for making an appropriate enterprise readiness or "fitness" assessment. In summary, enterprise readiness assessment helps prepare an organization in making successful mobile ICT adoption and transformation decisions.

5.1.2. Previous Readiness Assessment Models

The concept of readiness is not novel to the practitioner and academic communities. Previous readiness models can be broadly classified as economic and individual assessment framework. Economic readiness assessment models have examined country-level readiness for network technologies and e-commerce (Sachs, 2001). At the individual level, consumer readiness for new technologies has been the predominant model (Parasuraman, 2000). Enterprise or organizational readiness has received only anecdotal to moderate attention in the literature despite its obvious importance. Furthermore, all of these organizational models have focused their analysis on e-business readiness instead of ICT in general, and mobile ICT in particular (Oxley & Yeung, 2001; Peters, 2001; Amoroso & Sutton, 2002; Jeong, Gretzel, & Fesenmaier, 2002; Ocker & Mudambi, 2003; Bridges.org, 2005). Previous reviews have provided in-depth looks at existing readiness models (Huang, Huang, Zhao, & Huang, 2004; Holt, In Press). In this section, we briefly highlight the main aspects of existing readiness models and frameworks as they apply to our research. This review provides us with a broad foundation and generates specific ideas on how to develop our model of enterprise readiness for mobile ICT.

APEC's E-Commerce Readiness Assessment Guide. The Asia-Pacific Economic Cooperation (APEC) developed one of the first readiness assessment models for e-business (APEC, 1997). The goal of this model is to help governments evaluate issues critical in the advancement of e-commerce in countries in the Asia-Pacific region. Huang (Huang et al., 2004) reported that this model, for example, was used in the e-readiness assessment of Hong Kong. The APEC model measures readiness for e-commerce in six domains using a self-assessment approach. The six domains are:

1. Infrastructure and technology, such as speed, pricing, access, market competition, industry standards, foreign investment (35 indicators)
2. Access to network services, such as bandwidth, industry diversity, export controls, credit card regulation (24 indicators)
3. Current level and type of use of the Internet, such as use in business, government, homes (12 indicators)
4. Promotion and facilitation, such as industry led standards (9 indicators)
5. Skills and human resources, such as ICT education, workforce (9 indicators)
6. Positioning for the digital economy, such as taxes and tariffs, industry self-regulation, government regulations, consumer trust (11 indicators)

The assessment is based on opinions of individuals. Participants are asked to self-assess these 100 qualitative indicators and indicate their perceived level of regional e-readiness. No overall score is computed, and it does not provide a comparison to other regions.

CID's Readiness for the Networked World. The Center for International Development at Harvard University developed the "Readiness for the Networked World – a Guide for Developing Countries" model (Sachs, 2001). This model uses five categories with 19 indicators and describes determinants of a region's, especially a developing country's, readiness for the networked world. The five categories are Network Access with six indicators, Networked Learning with three indicators, Networked Society with four indicators, Networked Economy with four indicators, and Network Policy with two indicators. Indicators include availability, speed, and quality of network access, use of ICTs in schools, workplace, economy, government, and everyday life, ICT policy (telecom and trade), ICT training programs, and diversity of organization and relevant content online. This guide includes a web-based diagnostic tool that systematically rates the “stage” a region is in for each of these categories and provides descriptions of what is required to be in a particular stage. After the assessment, the model neither offers specific advice nor provides an overall assessment score; it only seeks to offer a starting point in an ICT planning process for a government (Huang et al., 2004). The CID model is similar to the APEC model in that it evaluates the e-readiness for a region.

The Economist’s Networked Readiness Index (NRI). The Economist Intelligence Unit (EIU) e-readiness model is primarily based on the CID Readiness Assessment model and tallies scores across six categories: five of these include a total of 29 indicators, while the sixth is the EIU’s business environment rankings (WorldEconomicForum, 2006). Each variable in the model is scored on a scale from one to ten. In general, variables rest on quantitative, statistical data; where quantitative data is not available, qualitative assessments by Economist Intelligence Unit country survey analysts are included.

Coined as the Networked Readiness Index (NRI), the six assessment categories include connectivity and technology infrastructure (25%), business environment (20%), consumer and business adoption (20%), social and cultural infrastructure (15%), legal and policy environment (15%), and supporting e-services 5%).

Net-Ready Model. One of the few organizational readiness assessment models is Cisco's NetReady model. The NetReady models aims to assess the e-readiness of an organization (Hartman & Sifonis, 2000). The primary object of the assessment is to compare companies pursuing or currently in e-business "with a benchmark and to classify a company into one of the four suggested e-business types" (Huang et al., 2004). The NetReady Model uses a quantitative approach. Evaluators respond to a questionnaire and indicate their level of agreement with assessment indicators in four categories: leadership, management, competence of organization and IT diffusion.

The first three of the aforementioned models were developed to evaluate readiness for a region, country, or community, rather than an organization or enterprise. Since the focus of our research is on enterprise readiness for mobile ICT, these models thus do not directly apply. Cisco's NetReady model has been used to assess e-readiness at the organizational level, which is directly applicable to our research study. Cisco's model, however, limits its assessment focus on e-business only and assesses readiness in four broad categories. In doing so, the Cisco model is only applicable to e-business assessments and does not map closely to specific mobile ICT related assessment areas. Given the novelty of mobile ICT and based on our analysis in Chapters 3 and 4, we thus believe that existing readiness assessment models do not sufficiently describe issues associated with our research domain.

As Huang correctly observed (Huang et al., 2004), existing readiness assessment models are proposed for different units of analysis, and applied in different perspectives and for different purposes. Nevertheless, they all have the following similar characteristics:

- They have a systematic and operational set of measurable indicators
- They have a hierarchical assessment structure
- Evaluators are able to do a self-assessment

5.1.3. A Dual Perspective on Enterprise Readiness

The assessment of enterprise readiness can be beneficial to companies in two distinct ways: (1) self-assessment and (2) potential customer identification. The most common use of enterprise readiness is a self-assessment of the organization, its capabilities and areas of improvements. This type of assessment is generally conducted by decision makers, IT managers, and executives that would like to evaluate how ready their own organization is, often in comparison to an industry benchmark or against its competitors. Self-assessment provides organizations with a current snapshot of the enterprise readiness for mobile ICT and provides a basis for strategies for the "to-be" state.

Another perspective on enterprise readiness for mobile ICT is the evaluation of a ICT solutions provider of potential customers. For example, an ICT solutions provider may want to identify potential customers that could not only benefit from mobile ICT (value analysis), but are also prepared to adopt it (readiness assessment). Enterprise readiness assessment thus is also a way for sales and marketing to target specific customers that could adopt their technology offerings. It can aid the ICT solutions provider in assembling the right team to the mobile ICT project if certain dimensional inefficiencies are identified. It also serves as an analytical and conceptual way of explaining to the customer what areas of the organization require improvement, deserve more attention, or are more critical in the adoption process.

5.2. Conceptual Framework

As we previously mentioned, the concept of enterprise readiness for ICT has received only limited attention in both the academic and business press literature. Preparedness, agility, and maturity are often some terms commonly associated and used in place of enterprise readiness (Bahouth, 1994; Lannes & Logan, 2004; Passerini & Patten, 2005). We argue that enterprise readiness enables organizations to become more agile and increase preparedness and maturity. Indeed, anecdotal evidence has shown that higher levels of organizational readiness generally lead to organizational agility and preparedness (Snyder-Halpern, 2001; Jutla et al., 2002; Abdinnour-Helm, Lengnick-Hall, & Lengnick-Hall, 2003; Siemieniuch & Sinclair, 2004). In this literature, organizational readiness has generally been classified as financial and technological readiness (Heslop, McGregor, & Griffith, 2001; Yi & Tung, 2003; Wu, 2004). These studies have also shown that organizational readiness creates lower levels of innovation risk and more successful ICT implementation outcomes.

While both financial and technological readiness are important pre-cursors to implementations of ICT, we argue they are not the only aspects that constitute enterprise readiness. The organizational adoption literature we reviewed in Chapter 3 supports this view. Extending previous theories of organizational adoption of ICT and existing readiness models (Hartman & Sifonis, 2000; Snyder-Halpern, 2001; Huang et al., 2004; Ruikar et al., 2006), we thus propose the following:

Proposition 1:
Enterprise readiness for mobile ICT is an assessment of an organization's (1) preparedness, (2) potential, and (3) willingness to adopt and implement mobile ICT.

More specifically, preparedness refers to an organization's ability to adopt, diffuse, and assimilate mobile ICT; potential refers to an organization's processes, employee, and strategy that could benefit from mobile ICT; and willingness reflects the attitudinal orientation of leadership and employee towards adopting mobile ICT. Based on our extensive literature review, we further argue the following:

Proposition 2:
Enterprise readiness for mobile ICT is comprised of eight dimensions: (1) technology, (2) data and information, (3) process, (4) resource, (5) knowledge, (6) leadership, (7) employee, and (8) values and goals.

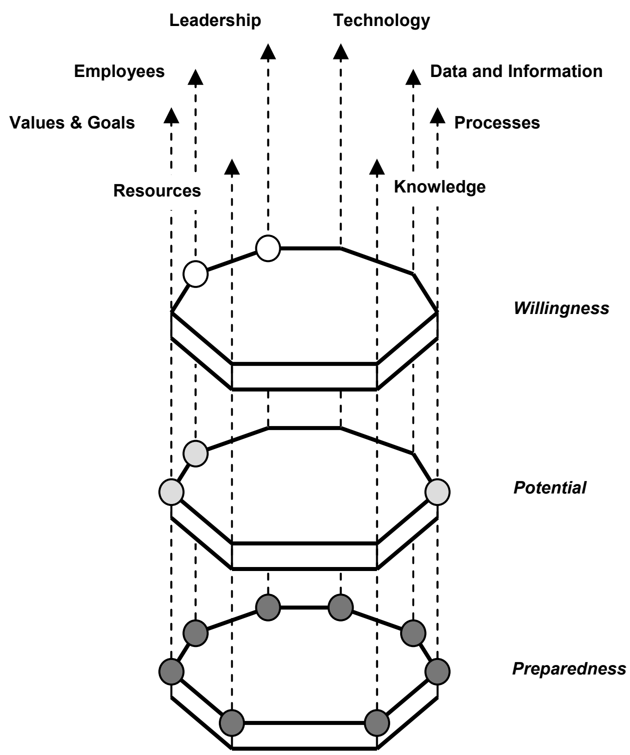


Figure 32. Conceptual Framework of Enterprise Readiness

A complete enterprise readiness assessment will thus involve an evaluation across the three layers - preparedness, potential, and willingness – and along all eight readiness dimensions (see Figure 32). Preparedness is assessed for all eight dimensions; potential is evaluated along the process, employee, and value and goals dimensions; and, willingness is assessed along the employee and leadership dimensions. The following section describes each dimension and its associated assessment indicators in further detail.

5.3. Readiness Dimensions and Assessment Indicators

Drawing on the extant technology adoption literature reviewed in Chapter 3, theoretical and practical support for each of the eight dimensions and associated assessment indicators is provided as follows:

5.3.1. Technology

Undoubtedly, today's enterprises are inextricably intertwined with information and communication technologies (ICT). Computer hardware, software, data and storage technology, networks, and security are all part of the overall enterprise technology portfolio. Virtually all aspects of enterprises utilize some aspect of ICT. As such a sound technology infrastructure is often the backbone of most digitally-enabled enterprises. Since most new ICT investments should leverage existing systems and infrastructures in place, it is critical that an enterprise's technology infrastructure is able to provide current capabilities and future options that can accommodate changing requirements. Mobile ICT solutions are not an exception. The first dimension of enterprise readiness for mobile ICT is thus the readiness of the existing organizational technology infrastructure. Technology Readiness can be understood as the ability of an enterprise's existing technological infrastructure (e.g. hardware, software, network services, and security) to support, facilitate, and enable a smooth adoption and implementation of mobile ICT.

There are many characteristics that describe readiness of an organization's technology infrastructure. Broadly speaking, a robust, comprehensive, and open-standards oriented technological infrastructure, which is flexible and scalable to accommodate any change and emerging requirements, generally tends to facilitate a higher level of technology readiness. Table 17 summarizes critical assessment areas of technology readiness.

Table 17. Assessment Areas of Technology Readiness

Assessment Areas			
▪ Standardization	▪ Scalability	▪ Availability	▪ Compatibility
▪ Flexibility	▪ Adaptability	▪ Reliability	▪ Maturity
▪ Modularity	▪ Integration	▪ Security	

Given the overall importance of technology infrastructure for today's organizations, it is argued that readiness along this dimension is a critical contributor to overall enterprise readiness for mobile ICT. Thus, the following hypothesis is argued:

H1: *Greater technology readiness will positively influence enterprise readiness for mobile ICT.*

5.3.2. Data and Information

In today's technology intensive organizations, data and information are abundant. Data and information are stored in databases, on desktops, servers, and edge devices.

Studies have shown that enterprise data has been rapidly increasing over the past years, often leading to disparate, disconnected, and non-integrated sources. Access to data and information is critical for all types of enterprises. Knowledge-intensive organizations, for example, require access to data and information to create new products and services; service-oriented organizations require data and information to meet and exceed customer requirements. Enterprises require data and information to ensure smooth operation across their entire supply chain; access and visibility enables an increase in efficiency and productivity, and potentially competitive advantage.

However, as enterprises grow, data and information maintenance and requirements become increasingly complex. It is not uncommon that enterprises have data islands, or data silos. Organizations that are planning to adopt and implement new enterprise ICT, particularly mobile ICT, often find that traditional systems have left them with very complex data architectures. Different systems contain different data sets and there is often a lack of a single unified view to enterprise data. Without a clear, well-structured and consistent view, it is almost impossible to derive any substantial value from enterprise data, meet customer needs, and identify future opportunities.

Particularly when considering implementing mobile ICT solutions, where professionals demand access to data and information at the "point-of-action", up-to-date, consistent, and actionable data and information is critical. Having access to up-to-date data and information in the field enables mobile workers to perform their tasks more effectively and leads to higher levels of productivity. Thus, having data and information ready for use with mobile ICT is very important.

Data and Information Readiness thus refers to the ability to federate data from multiple sources, provide a unified view of enterprise data, and make it available to any system at the time when it is needed. Higher levels of data and information readiness is achieved through a consistent, reliable, and secure data and information infrastructure that provides both synchronization and data recovery capabilities for highly disconnected and variable environments. Table 18 summarizes critical assessment indicators of data and information readiness.

Table 18. Assessment Areas of Data and Information Readiness

Assessment Areas			
▪ Data Integration	▪ Data Consistency	▪ Data Transparency	▪ Data Security
▪ Recovery Mechanisms	▪ Mature Data Standards	▪ Data Availability	▪ Data Synchronization Capability

We therefore posit the following hypothesis:

H2: *Greater data and information readiness will positively influence enterprise readiness for mobile ICT.*

5.3.3. Process

Modern enterprises tend to have several different types of organizational processes. Using Garvin's topology, organizational processes can be classified as work related, behavioral, management and change related (Garvin, 1998). Processes represent a formalized way to represent how enterprises operate, shed light into the organizational "black box" and provide a particular level of organizational analysis (Garvin, 1998). Processes also provide insights into managerial behavior and how organizational decisions are made. Processes also describe how enterprises implement and manage change. In other words, organizational processes describe how enterprises do business, how humans make decisions, and how change occurs. Having efficient processes enables organizations to disseminate knowledge across the entire organization and supply chain. Drawing on the capability maturity model, there are several levels of process maturity (Basole & DeMillo, 2006). The higher the maturity level, the more repeatable, defined, managed, and optimized organizational processes are. It is evident that organizations with higher level of process maturity and readiness, tend to be more prepared for change.

The third dimension of enterprise readiness for mobile ICT is thus process readiness. Process Readiness refers to the ability of organizational processes (e.g. human, information, organizational change, incentives/rewards, governance, etc.) to facilitate and support the adoption and implementation of mobile ICT. Well-defined, documented, managed, repeatable and optimized processes are highly desired characteristics. Table 19 summarizes critical assessment indicators of process readiness.

Table 19. Assessment Areas of Process Readiness

Assessment Areas			
▪ Process Standardization	▪ Process Maturity	▪ Adaptive Processes	▪ Net-Enablement
▪ Process Policies	▪ Formalization	▪ Quality and Extent of Documentation	

Based on the aforementioned argument, we posit the following:

H3: *Greater process readiness will positively influence enterprise readiness for mobile ICT.*

5.3.4. Knowledge

With the emergence of the information economy and the digitally-enabled firm, knowledge is considered a key organizational asset. Indeed, recent studies have shown that over 60% of the U.S. labor force consists of knowledge and information workers. Knowledge enables organizations to operate smarter and use resources more effectively. It also enables organizations to not only sense-and-respond, but also anticipate changes in the environment and prepare accordingly. Organizations tend to acquire knowledge through a variety of organizational learning mechanisms (Garvin, 1998; Eby, Adams, Russell, & Gaby, 2000). Through feedback from customers and the environment in general, observation of the competitive market, alliances with suppliers and partners, trial and error, organizations learn to respond to changing conditions. A wealth of knowledge is also often available within the organization. Innovation and technology experts can provide insight to organizational change issues related to new ICT. Previous experience with successful and failed projects also adds to the knowledge base of organizations. The adoption and implementation of complex ICT that can have a profound impact on the entire enterprise often requires new knowledge. Having internal sources of knowledge, or access to external experts is therefore often critical in the success of ICT implementations.

Knowledge Readiness can thus be understood as an enterprise's capacity and capability of both general and specific knowledge required to adopt and implement mobile ICT. General knowledge includes awareness and understanding of the state of emerging ICT, regulatory requirements, ICT-related decision-making processes, strategic planning capacity, and previous experiences with ICT adoptions and implementations. Specific knowledge encompasses an awareness and understanding of the opportunities, challenges, barriers, and opportunities that come with the adoption and implementation of mobile ICT. This will includes an understanding of mobile ICT characteristics, its potential impact on strategy, processes, and people, and the changing enterprise mobility market. Table 20 summarizes critical assessment areas of knowledge readiness.

Table 20. Assessment Areas of Knowledge Readiness

Assessment Areas			
▪ Awareness of Needs	▪ Awareness of Mobile ICT Capabilities	▪ Understanding of Regulatory Requirements	▪ Value and Impact Awareness
▪ Previous Experience	▪ Formalized KM System	▪ Awareness of Competitive Environment	

This leads us to the following hypothesis:

H4: *Greater knowledge readiness will positively influence enterprise readiness for mobile ICT.*

5.3.5. Resource

Previous studies have shown that organizations with financial, human, and social resources tend to be well prepared for the adoption and implementation of new ICT (Abdinnour-Helm et al., 2003; Kaplan & Norton, 2004; Siemieniuch & Sinclair, 2004; Chang & Chen, 2005). Indeed, the availability and appropriate allocation of resources to ICT initiatives is often considered a critical pre-cursor to enterprise readiness (Kaplan & Norton, 2004). Resource Readiness thus refers to an organization's ability to allocate resources necessary to support the adoption, implementation, maintenance, and continued use of mobile ICT. Resources may include financial (e.g. budget, training funds, etc.), human (e.g. support staff, innovation champion, expertise, consultants, etc.), and social assets (e.g. training, vendor support, alliances, partnerships, etc.). The availability of resources for current and future plans is an important aspect in successful assimilations of mobile ICT. Table 21 summarizes critical assessment areas of resource readiness.

Table 21. Assessment Areas of Resource Readiness

Assessment Areas			
▪ Financial Support	▪ IT Staff Capability	▪ IT Staff Availability	▪ Availability of Consultant Expertise
▪ Vendor Support	▪ Innovation Champions	▪ Training Resources	

Based on the arguments found in previous studies, the following hypothesis is posited:

H5: *Greater resource readiness will positively influence enterprise readiness for mobile ICT.*

5.3.6. Leadership

The benefits of strong leadership and top management support in ICT implementation are well-established in the literature. It has been shown that executives that have the ability to articulate the strategic vision of the firm and communicate the value and importance of ICT tend to have positive influence on the probability of success of ICT implementations (Hartman & Sifonis, 2000; Jutla et al., 2002; Ward & Peppard, 2002). While strategic vision is one aspect, it has also been stressed that execution of strategic plans are equally, if not more important to ICT success. Particularly for emerging ICT, such as mobile ICT, it is critical that management fully supports and commits to the ICT implementation initiatives. Previous experience with ICT change initiatives have also been shown to positively impact ICT adoption success. The innovation literature has argued that executives that exhibit leadership champion qualities tend to have a high competency to lead and manage, and are often innovative and risk-oriented. The aforementioned literature highlights that certain desirable leadership attributes and abilities can lead to a higher level of ICT adoption and implementation success.

The sixth dimension of our enterprise readiness framework is thus the readiness of leadership. Leadership Readiness can be understood as the executive teams' ability to anticipate, manage, and execute the adoption and implementation of mobile ICT. It reflects an appropriate level of skills, innovativeness, knowledge, and risk orientation of top management. It also indicates the level of commitment, encouragement, support, and strategic vision that management offers in association to the adoption and implementation of mobile ICT. Table 22 summarizes critical assessment indicators of leadership readiness.

Table 22. Assessment Areas of Leadership Readiness

Assessment Areas			
▪ Strategic Vision	▪ Ability to Communicate	▪ Ability to Execute	▪ Previous Experience with ICT iniatitives
▪ Previous Experience with Change Initiatives	▪ Support	▪ Commitment	▪ Ability to lead and manage
▪ Innovativeness	▪ Leadership Champions		

This leads us to the following hypothesis:

H6: *Greater leadership readiness will positively influence enterprise readiness for mobile ICT.*

5.3.7. Employee

The success of organizational adoption and implementation of ICT ultimately depends on if and to what extent employees are using it and whether it has infused into organizational processes (Parasuraman, 2000; Yi & Tung, 2003). As such, employees play a critical part in the overall enterprise adoption process. The literature on end-user characteristics influencing technology adoption is extant. Determinants include attitudinal orientation, education level, and learning abilities. Employee Readiness can thus be understood as individual characteristics necessary for the successful adoption of mobile ICT. These characteristics include individuals' attitude and motivation towards innovation and change, their risk orientation, their level of ICT skills and previous experience, and their ICT literacy and learning capabilities. Table 23 summarizes critical assessment indicators of employee readiness.

Table 23. Assessment Areas of Employee Readiness

Assessment Areas			
▪ Innovativeness	▪ Risk-Orientation	▪ Resistance level	▪ Motivation
▪ Attitude towards Change	▪ Attitude towards mobile ICT	▪ ICT Skills	▪ Learning Capabilities

The following hypothesis is argued:

H7: *Greater employee readiness will positively influence enterprise readiness for mobile ICT.*

5.3.8. Values & Goals

The eight and final dimension of enterprise readiness proposed in this research is that of values and goals readiness. This can be considered the "glue" of all of the aforementioned dimensions. Previous literature has argued that certain structural organizational characteristics, such as size, centralization, and functional differentiation often influence an organization's adoption behavior. Similarly, drawing on the organizational culture literature, it has been shown that an organizational environment that supports innovation and risk, encourages communication, exhibits trust across all levels, and provides rewards and incentives to be innovative, tends to be more prepared for change and new ICT implementation. Particularly with ICT that have the potential of fundamentally changing the way business is done and the way people work, communicate, and interact – as is the case with mobile ICT – organizations must have a culture and environment that can embrace the change.

Table 24. Assessment Areas of Values and Goals Readiness

Assessment Areas			
▪ Risk-Orientation	▪ Embracement of Change	▪ Innovative Culture	▪ Encouragement of Change and Innovation
▪ Shared and Communicated Strategic Vision	▪ Trust	▪ Values Quality	▪ Aligns Rewards and Incentives with Innovation

Values & Goals Readiness can thus be understood as an organization's ability to integrate mobile ICT value propositions into its corporate philosophy, culture, and business environment and communicate it to its stakeholders (Karandikar et al., 1993; Eby et al., 2000; Lannes & Logan, 2004). Values and goals readiness reflects the fit between existing structural and nonstructural enterprise characteristics and mobile ICT characteristics (Snyder-Halpern, 2001). Structural characteristics may include organizational size, centralization, formalization, autonomy, specialization, functional differentiation, strategic objectives and goals. Nonstructural characteristics may include culture, bureaucracy, task environment, and political climate. Table 24 summarizes critical assessment indicators of values and goals readiness

H8: *Greater values and goals readiness will positively influence enterprise readiness for mobile ICT.*

5.4. Summary

This chapter described and expanded on the novel concept of enterprise readiness for mobile ICT. The chapter commenced with highlighting the importance of readiness assessment and described some related readiness assessment models. The chapter then argued that readiness assessment can serve two distinct purposes: from an organizational perspective, it provides the means to self-assess readiness to adopt and implement mobile ICT; from a vendor or sales perspective, it enables firms to identify potential clients and customers that are ready to adopt and implement mobile ICT.

Based on the extant theoretical background provided in Chapters 3 and 4, we then introduced our multi-layer, multi-dimensional conceptual framework of enterprise readiness and argued that it consists of eight dimensions: technology readiness, data and information readiness, process readiness, knowledge readiness, resource readiness, leadership readiness, employee readiness, and values and goals readiness. Each dimension can be assessed with several assessment indicators. Theoretical and practical support for each dimension is provided. It should be noted that all of these dimensions may have an indirect influence on each other and must therefore be considered as a whole. A lack, or deficiency, in one readiness dimension may influence the overall enterprise readiness for mobile ICT. Similarly, a lack of readiness in one of the three layers will also result in a lower degree of enterprise readiness. As such, a comprehensive assessment of all dimensions on all layers should be conducted.

The following chapters describe our research approach and discuss our main findings.

CHAPTER 6:

RESEARCH DESIGN AND METHODOLOGY

6.1. Introduction

The previous chapter theoretically identified key dimensions and assessment indicators that have predominantly been used to describe and evaluate an enterprise's readiness for mobile ICT. However, since the concept of enterprise readiness is not very well defined and the literature is relatively thin compared to the vast experience accumulated by experts and practitioners in adopting and implementing mobile ICT, we felt that it would be appropriate to use an exploratory, theory-building research approach to validate our initial theories of enterprise readiness (Galliers & Land, 1987).

In this chapter, we present the research design and data collection methods used to empirically validate the dimensions and indicators identified in Chapter 5. In particular, this chapter describes the research design, the research methodology, the identification and selection of the expert panel and participants, the data collection instrument and procedures, the pre-test study, and general ethical aspects of the research.

6.2. Research Design

A research methodology is a "structured set of guidelines or activities to assist in generating valid and reliable research results." (Mingers, 2001). Even though it is always desirable to select a research methodology that maximizes generalizability, realism, and precision (McGrath, 1982), all research methodologies are inherently flawed in some respect (Dennis & Valacich, 2001). In general, there are two types of research approaches in information systems literature, namely a quantitative or qualitative approach. Previous scholars have argued that combining several research methods may increase the rigorousness of a study, as these different methods can compensate for each other and enhance one another's strengths (Kaplan & Duchon, 1988). Thus, there is a need and desire for combining quantitative and qualitative methods.

Quantitative research is "generally characterized by a methodology of formulating hypotheses that are tested through controlled experiment or statistical analysis" (Kaplan & Duchon, 1988). Examples of quantitative methods include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modeling.

On the other hand, qualitative research "involves the use of qualitative data to understand and explain social phenomena" (Myers, 1997). Examples of qualitative methods include action research, case study research and ethnography. The most common qualitative data collection methods include document analyses, observations, interviews and questionnaires, and the researcher's impressions and reactions (Myers, 1997). Although most IS researchers have utilized either a quantitative or qualitative methodology in isolation (as shown in the Literature Analysis performed in Chapter 3), there has been an increasing number of studies that advocate the benefits of combining one or more research methods (Kaplan & Duchon, 1988; Lee, 1991; Orlikowski & Baroudi, 1991; Mingers, 2001).

Combining multiple methods may lead to a richer understanding of the phenomena under investigation and additional insights may be revealed that would otherwise remain undiscovered via a single methodological approach (Kaplan & Duchon, 1988).

Based on the above discussions, this dissertation uses a mixed qualitative and quantitative research approach to investigate the salient dimensions of enterprise readiness and associated assessment indicators. More specifically, the data collection and validation process is conducted in two main stages as depicted in Figure 33.

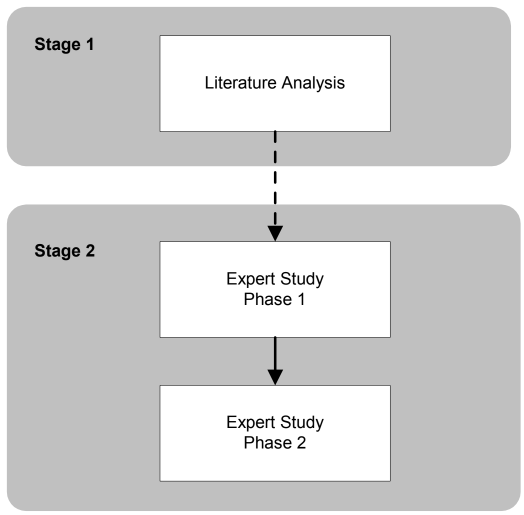


Figure 33. Conceptual Overview of the Research Design

6.2.1. Literature Analysis

In the first stage, relevant readiness dimensions and assessment indicators were identified using a qualitative approach (literature analysis). These dimensions were primarily derived from the organizational innovation adoption literature. Please refer to Chapters 3 and 4 for a detailed description of the research methodology and results.

6.2.2. Modified Delphi Study

An obvious source for the type of information required for this study is an expert in the field with experience in making strategic technology decisions and managing adoption and implementations of ICT. However, a single expert is not likely to have the personal experience of all salient determinants needed to yield a comprehensive list of readiness dimensions and assessment indicators (Gupta & Clarke, 1996). To ensure a reliable and valid data collection process it is therefore pertinent to open the inquiry to divergent opinions and seek feedback-based convergence and closure on dimensions and assessment indicators that really matter in determining enterprise readiness for mobile ICT. The second stage of this study thus consisted of a two-phase expert study using a modified Delphi approach.

The Delphi method was developed by the RAND Corporation and is primarily used as a method for structuring group communication processes (Delbecq, VandeVen, & Gustafson, 1975; Linstone & Turoff, 1975). The method consists principally of knowledgeable and expert contributors individually completing an open-ended questionnaire and submitting their responses to a central investigator (Dalkey & Hellmer, 1963). The Delphi method lends itself especially well to exploratory theory building (Meredith, Raturi, Amoako-Gyampah, & Kaplan, 1989) on complex, interdisciplinary issues, often involving a number of new or future trends. The investigator processes the contributions, looking for central and extreme tendencies, and the rationales therefore (Dalkey & Hellmer, 1963). In subsequent rounds of the procedure, participants rate the relative importance of individual items and also make changes to the phrasing or substance of the items. Through a series of rounds the process is designed to yield consensus (Linstone & Turoff, 1975).

In general, a Delphi study has three important advantages. First, anonymous, personal responses are at the heart of the procedure. A Delphi study assembles participants' opinions collectively without bringing them into the same place or room. This can reduce the overall research costs. More importantly, through avoiding participants getting together, a Delphi study can minimize the possible effect of the dominant person, due to status problems, and it can lead the group to share responsibility. Shared responsibility is a catalyst for reaching an agreement, and also can facilitate satisfaction through involvement in and claims to the results. Second, carefully managed iterative feedback can minimize possible direct conflict and the disadvantages that dispute leads to: abruptly accepting or discarding other opinions. The problem of a dominant participant can cause other problems, such as focusing on personal characteristics rather than concentrating on the issues at hand, and possible deviant or novel ideas. Finally, in terms of a statistical group response, a Delphi study ensures that each participant's opinion is contemplated in the final response.

However, the Delphi approach also possesses three critical disadvantages. First, the Delphi is inherently labor intensive and time consuming. If the time frame is short, a Delphi approach is not useful. In many cases, especially if mailed questionnaires are employed, a Delphi study usually takes several weeks, from decision-to-go to the final outcome. The participants' commitment to the Delphi process is a key to its success. Second, the Delphi method requires of the participants some degree of written communication skills. Since the Delphi is bounded by a written communication instrument, it is important for all participants to be able to understand, and to answer well within a written format. Finally, in order to get a valuable outcome, the Delphi needs highly motivated respondents. Since there is no guarantee that the Delphi questionnaires will be completed and returned, the selection of qualified participants depends upon their interests, motives, and benefits throughout the overall procedure.

The modified Delphi technique is similar to the full Delphi in terms of procedure (i.e., a series of rounds with selected experts) and intent (i.e., to predict future events and to arrive at consensus) and overcomes some of the disadvantages displayed by the traditional approach. The major modification consists of beginning the process with a set of carefully selected items to provide respondents with a context within which to consider their responses. These pre-selected items may be drawn from various sources including related competency profiles, synthesized reviews of the literature, and interviews with selected content experts. The primary advantages of this modification to the Delphi is that it (a) typically improves the initial round response rate, and (b) provides a solid grounding in previously developed work, and (c) decreases the number of rounds required to achieve consensus. In the following sections, the two phases of the Expert Study are discussed in further detail.

6.3. Expert Study

6.3.1. Advantages of a Web-Based Expert Study

While expert studies have traditionally been conducted in paper-based form, the use of the Internet as a data collection medium has many advantages (Sills & Song, 2002; Faught, Whitten, & Green Jr., 2004). These advantages include:

- The entire process from data collection to data analysis is seamless. Data is collected and stored centrally in a file which can be read directly into statistical analysis software. Hence, there is no lag time between data collection and data analysis (Zhang, 2000).

- It enables faster turnaround as hundreds of respondents can fill out the survey and submit it immediately.
- Data integrity can be insured because responses can be validated before they are recorded (Klassen & Jacobs, 2001).
- Data reliability is increased because the data is entered by the respondent rather than processed by the researcher.
- High response rates are more likely since the survey can be completed anywhere in the world via a web browser making the process more convenient and less intrusive. In addition, responses can be limited to a target audience using PIN numbers, passwords or IP restrictions.
- Cost is reduced through the elimination of postage and paper forms.

6.3.1. Development of the Web-Based Expert Study

The development of the web-based study included the design and coding of the web-based questionnaire, and quality testing of its overall usability. After several rounds of design modifications, a beta version was released for pre-testing. Using the responses of the pre-test, spelling changes and minor cosmetic updates were made to enhance the overall appearance of the web-based expert study. A final version of the web-based expert study was then deployed for production and was accessible to users at http://www.mobilereadiness.info. A conceptual overview of the design and development process of the two phases is shown in Figure 34.

The web-based expert study was developed using the scripting language PHP (Hypertext Preprocessor). PHP is an open source, server-side, HTML-embedded scripting language used to create dynamic Web content. It was selected over ASP (Application

Server Pages) due to its relatively low development and implementation cost and ability to produce sophisticated interactive user interfaces.

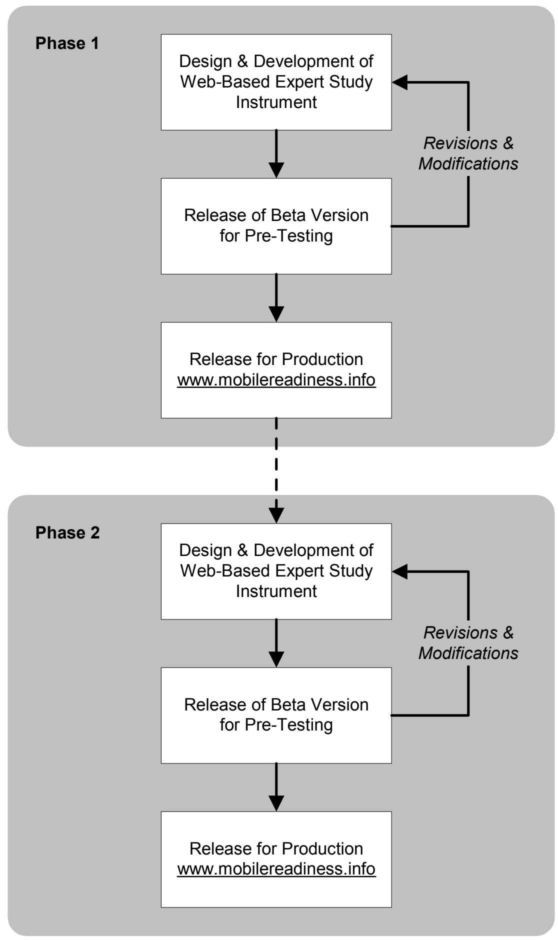


Figure 34. Development Phases of the Web-Based Expert Study

PHP is compatible with a number of different types of databases. Since implementation and maintenance cost was an important issue, we decided to use the MySQL database. MySQL is an open-source RDBMS (relational database management system) that is platform agnostic, i.e. it can run on UNIX, Windows, and Mac operating systems. It is popular alternative to alternative proprietary database systems because of its economy, speed and reliability, and has been proven to work well with PHP.

The front-end design of the web-based expert study was designed using Macromedia Dreamweaver and Fireworks. Radar charts (or spider graphs) were created using PEAR, an open-source PHP image library. This package was chosen over JPGraph due to its advanced graph display capabilities and font selection flexibility.

6.3.2. Identification and Selection of Expert Panel and Participants

The success of an expert study depends principally on the careful selection of the participants who understand the issues, have a vision, and represent a substantial variety of viewpoints (Linstone & Turoff, 1975). The use of experts is critical; the more a person knows about a given area, the better able that individual is to make recommendations and predictions about the future directions and trends of that area. The selection of the right experts thus provides overall content validity to the task at hand.

Since the information solicited for this study requires in-depth knowledge and sound experience about strategic technology investment decisions and organizational decision making, we were looking to select a focused group of experts that could provide opinions on salient dimensions of enterprise readiness dimensions and their assessment indicators (Bryman, 1996). The following criteria were devised to correctly identify eligible participants for the two phases of the web-based expert surveys.

1. Practitioners and academics at senior levels (C*X*O, VP, Senior Manager, Full Professor) that have extensive working and research experience in the information technology management and strategy domain

2. Experts currently, recently or directly involved in the management of ICT projects.
3. Experts that have detailed knowledge of mobile ICT.

In order to obtain the most valuable opinions, only participants who met at least two of the three sampling criteria were selected. In some expert studies, participants are selected through a "nomination" process in which recognized experts are solicited but also asked to provide the names of other experts. For our expert study, however, we used a purposive sampling approach (Benbasat & Zmud, 1999).

Based on a list of academic affiliates and industry members of the Tennenbaum Institute, we initially identified 28 potential participants for Phase 1. We then sent them an email invitation with a link to the web-based expert study explaining the purpose of this study and the modified Delphi process. Past studies have typically utilized between five and 30 experts, based on the finding that larger groups create few additional ideas and limit the in-depth exploration of those generated (Delbecq et al., 1975). Eleven (11) experts agreed to participate in our study (Response Rate: 39.3%), a number corresponding well with Clayton's rule-of-thumb that 8-20 people are an adequate panel size (Clayton, 1997). The composition of the final group of participants indicates a balanced view for the expert survey, with significant experience in technology strategy and mobile ICT. A snapshot of important demographic panel information is given in Table 25.

For the second phase of the expert study, we sought participation of experienced participants based on the same three criteria. For this phase, however, we expanded our pool of potential participants beyond the experts identified in Phase 1. This was accomplished by approaching some of the executives of CTIA (Cellular Telecommunications & Internet Association) member companies that offered mobile enterprise solutions. The list of members companies was readily available on the CTIA website (CTIA, 2006). Contributions were also sought from reviewers, committee members, and participants of the past three Mobile Business (M-Business) conferences (ICMB, 2006). We also sought participation from members of the Mobile Enterprise Alliance (MEA, 2006), a non-profit organization that exclusively deals with organizations involved and interested in enterprise mobility. This resulted in the inclusion of additional participants, including academics and industry practitioners. Based on these sources, our potential list of participants was 367 individuals. Eighteen (18) invitations were returned due to e-mail delivery failure. While 342 participants read the e-mail invitation, only a total of 135 individuals registered, and 109 participants, including the 11 experts from Phase 1, completed the entire study, resulting in a net response rate of 29.7%. A demographic snapshot of Phase 2 participants is shown in Figure 35 (a-g).

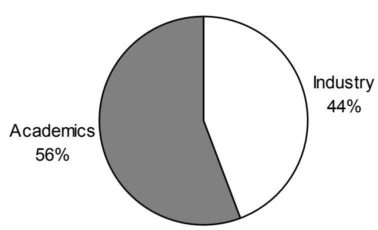
Table 25. Phase 1 Demographic Snapshot

Participant	Highest Degree Earned	Job Title	Industry	Company Size	Company Revenue
1	PhD	Professor	Academics	50 – 99	\$5 - \$10 million
2	PhD	CIO	Academics	1,000 – 3,499	\$100 - \$250 million
3	Bachelors	CEO	IT Investment	1 – 10	\$1 - \$5 million
4	Masters	Sr. Research Engineer	Consulting	1,000 – 3,499	\$100 - \$250 million
5	PhD	VP and Director	Research	1,000 – 3,499	\$100 - \$250 million
6	Masters	Vice President	Manufacturing	10,000 +	\$1 billion +
7	PhD	Professor	Academics	1,000 – 3,499	N/A
8	PhD	Professor	Academics	1,000 – 3,499	\$250 - \$500 million
9	Bachelors	VP, Technology	Technology	100 – 199	\$5 - \$10 million
10	Masters	Managing Director	Investment Banking	10,000 +	\$1 billion +

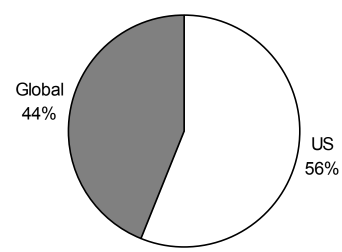
11	Bachelors	VP, Strategy	Telecommunications	10 – 49	$1 - $5 million

Table 25. (continued)

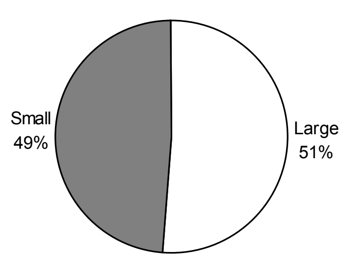
Participant	Total Years of Experience	Years of ICT Experience	Years of Mobile ICT Experience	Involved in Company's ICT Budget	Company Has Deployed Mobile ICT	Company Has Mobile ICT Strategy
1	10+	10+	4-6	No	No	No
2	10+	10+	10+	Yes	Yes	Yes
3	10+	10+	7-9	Yes	No	No
4	10+	10+	1-3	No	Yes	No
5	10+	10+	4-6	Yes	Yes	No
6	10+	10+	1-3	Yes	No	No
7	10+	10+	7-9	No	No	No
8	10+	10+	4-6	Yes	No	No
9	10+	10+	1-3	No	Yes	Yes
10	10+	10+	10+	No	Yes	Yes
11	7-9	7-9	1-3	Yes	Yes	Yes



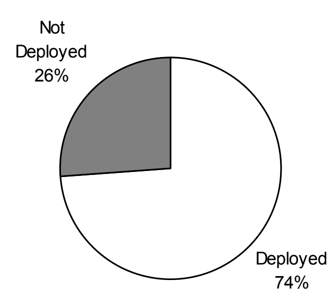
(a) Industry vs. Academics



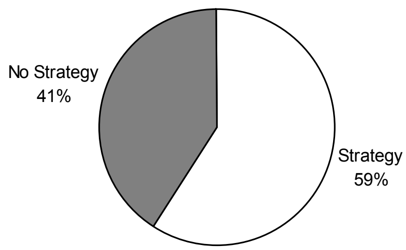
(b) US vs. Global



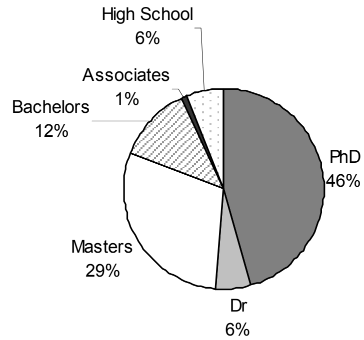
(c) Large vs. Small Organizations



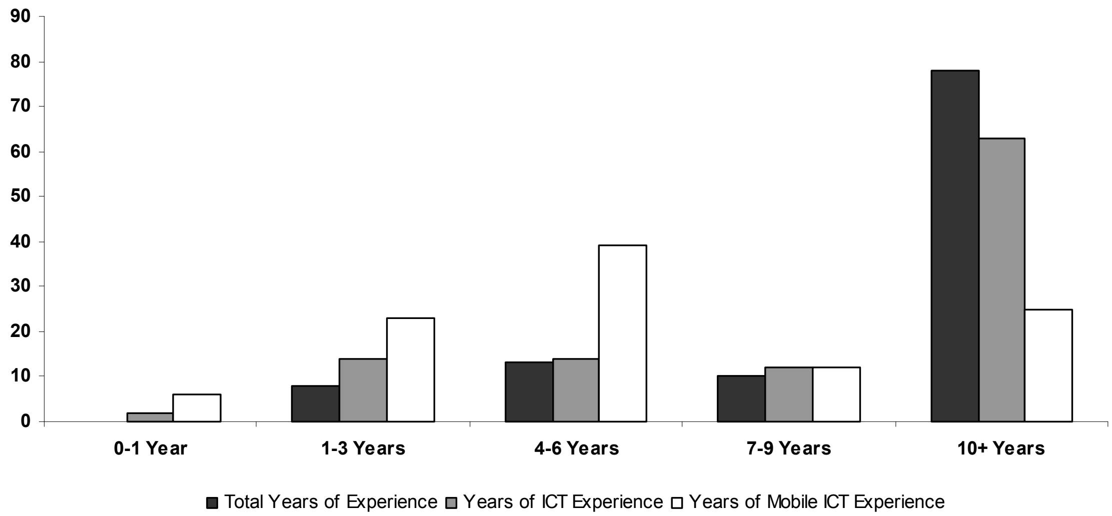
(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy



(f) Highest Degree Earned



(g) Years of Total, ICT, and Mobile ICT Experience

Figure 35. Phase 2 Demographic Snapshot (a-g)

6.3.3. Instrumentation

The objective of Phase 1 was to validate the eight readiness dimensions, their definitions, and relevant assessment metrics obtained from the literature analysis. Since these dimensions were theoretically identified and defined in the literature, a semi-structured approach to data collection was used (Benbasat & Zmud, 1999).

The web-based expert study was split into three main sections. The first section collected demographic information, such as current position, company, industry, annual revenue, and years of work experience. The second section requested expert panelist to respond to the following questions for each of the eight dimensions:

1. Are the description and indicators broad enough to understand and assess this dimension?
2. If you do not consider them sufficient, how would you modify them? Please describe.
3. Please list and describe any other indicators that you consider important in assessing this dimension.

The last section asked to identify and define any additional dimensions that they thought were needed to adequately enterprise readiness for mobile ICT.

The objective of Phase 2 was to determine the relative importance of each of the readiness dimensions validated in Phase 1 of the study and what assessment indicator levels were generally observed for high dimensional readiness.

In order to do so, Phase 2 was split into three sections. The first section asked participants to respond to the following question for each of the validated dimensions on a five-point Likert scale (Not Important (1) to Critical (5)):

1. How important is it to assess this dimension when planning for mobile ICT?

The second section asked participants to consider organizations in their industry (or peer group) and indicate the extent to which they agreed or disagreed with a set of statements (on a five-point Likert scale) that related to assessment indicators levels to high dimensional readiness. A sample of statements for technology readiness is shown below. The full set of statements can be found in Appendix A.

"Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements. Organizations that exhibit a high level of Technology Readiness (hardware, software, network, security) tend to …

1. Have a technology infrastructure based on open standards and interfaces.
2. Have a flexible and modular technology infrastructure.
3. Have a technology infrastructure that is adaptable and scalable to changing requirements.
4. Have a highly available, reliable, and secure technology infrastructure.
5. Have a technology infrastructure compatible with mobile ICT requirements."

The last section used a visual (radar graph) assessment approach to determine the relative importance of each of the eight validated readiness dimensions. Previous studies have shown that practitioners tend to prefer assessment of criteria at discrete number of levels, generally ranging from three to five. For the purposes of this dissertation, we utilized a three-level assessment of each readiness dimension. The assessment levels used to describe the degree of dimensional readiness are "high", "moderate", and "low".

In order to determine the relative importance of each of the eight dimensions at the aforementioned three assessment levels, it would require a full factorial design of experiment of $3^8 = 6{,}561$ unique runs. The time and cost involved in conducting and accurately evaluating this type of experiment would be enormous.

To alleviate this problem, a fractional factorial design of experiment (DOE) can be used (Wu & Hamada, 2000). A fractional factorial DOE includes selected combinations of factors and levels (Dey, 1985). It is a carefully prescribed and representative subset of a full factorial design. A fractional factorial DOE is useful when the number of potential factors is relatively large because they reduce the total number of runs required (Montgomery, 2000). By reducing the number of runs, a fractional factorial DOE will not be able to evaluate the impact of some of the factors independently. In general, higher-order interactions are confounded with main effects or lower-order interactions. Because higher order interactions are rare, usually one can assume that their effect is minimal and that the observed effect is caused by the main effect or lower-level interaction.

In order to determine the optimal combination of factors, fractional factorial designs with minimum aberration are often regarded as the best approach and are commonly used in practice (Wu & Hamada, 2000). A minimum aberration design is one that achieves the greatest resolution and minimizes the aliasing of two-factor interactions in its class of designs (Fries & Hunter, 1980). Less technically, the criterion operates by choosing design generators that produce the smallest number of pairs of confounded interactions of the crucial order. For a more complete discussion of the role of design criteria in experimental design, please see (Wu & Hamada, 2000). It should be noted that minimum aberration is a combinatorial criterion, not a statistical criterion. Nevertheless, it is reasonable from a statistical point of view (Fries & Hunter, 1980).

Having identified eight dimensions (or factors) measured at three levels (i.e. high=3, moderate=2, and low=1), we utilize the $k = 8$ 27-run design with fraction and resolution of 3_{III}^{8-5} (Wu & Hamada, 2000). The associated design generators are as follows:

$$D = AB \qquad E = ABC \qquad F = AB^2C \qquad G = AC^2 \qquad H = BC^2$$

Table 26. Fractional Factorial Experimental Design

	Tech.	Data & Inform.	Processes	Knowledge	Resources	Leadership	Employees	Values & Goals
1	Low	Low	Low	Low	Low	Low	Low	Low
2	Low	Low	Moderate	Low	Moderate	Moderate	High	High
3	Low	Low	High	Low	High	High	Moderate	Moderate
4	Low	Moderate	Low	Moderate	Moderate	High	Low	Moderate
5	Low	Moderate	Moderate	Moderate	High	Low	High	Low
6	Low	Moderate	High	Moderate	Low	Moderate	Moderate	High
7	Low	High	Low	High	High	Moderate	Low	High
8	Low	High	Moderate	High	Low	High	High	Moderate
9	Low	High	High	High	Moderate	Low	Moderate	Low
10	Moderate	Low	Low	Moderate	Moderate	Moderate	Moderate	Low
11	Moderate	Low	Moderate	Moderate	High	High	Low	High
12	Moderate	Low	High	Moderate	Low	Low	High	Moderate
13	Moderate	Moderate	Low	High	High	Low	Moderate	Moderate
14	Moderate	Moderate	Moderate	High	Low	Moderate	Low	Low
15	Moderate	Moderate	High	High	Moderate	High	High	High
16	Moderate	High	Low	Low	Low	High	Moderate	High
17	Moderate	High	Moderate	Low	Moderate	Low	Low	Moderate
18	Moderate	High	High	Low	High	Moderate	High	Low
19	High	Low	Low	High	High	High	High	Low
20	High	Low	Moderate	High	Low	Low	Moderate	High
21	High	Low	High	High	Moderate	Moderate	Low	Moderate
22	High	Moderate	Low	Low	Low	Moderate	High	Moderate
23	High	Moderate	Moderate	Low	Moderate	High	Moderate	Low
24	High	Moderate	High	Low	High	Low	Low	High
25	High	High	Low	Moderate	Moderate	Low	High	High
26	High	High	Moderate	Moderate	High	Moderate	Moderate	Moderate
27	High	High	High	Moderate	Low	High	Low	Low

Using this fractional factorial design with minimum aberration, we obtain the following 27-run experiment shown in Table 26. The associated enterprise readiness profiles are shown in Appendix B. A sample enterprise readiness profile of run #18 is shown in Figure 36.

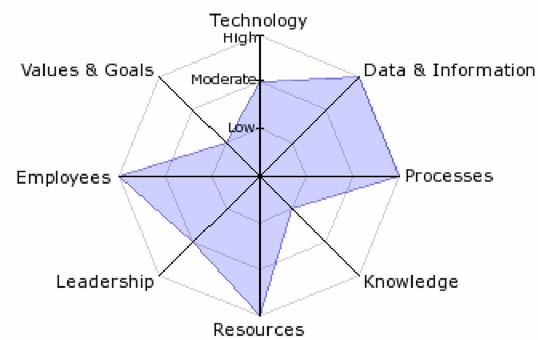


Figure 36. Sample Enterprise Readiness Profile

Using the 27 enterprise readiness profiles, Section 3 of Phase 2 then asked the participants to indicate their perceived level of overall enterprise readiness for each of the profiles on a five-point Likert scale from very low (=1) to very high (=5).

6.3.4. Pre-Testing

Before the formal release of the two phases of the survey, two pre-test rounds for each phase were conducted (Hunt, Sparkman Jr., & Wilcox, 1982). The first pre-test involved examination of the questionnaire by eight doctoral students. Based on their feedback, certain items were reworded and minor layout changes were made to improve its clarity and readability. The second round included six doctoral students and one staff member. As they suggested no major changes, the web-based expert study questionnaire for each phase was deemed ready for use. The two phases of the survey development and testing led to a refinement and restructuring of the instrument; it also resulted in establishing initial content validity and overall readability of the expert study (Dennis & Valacich, 2001).

6.3.5. Data Collection

Phase 1 and 2 study participants were sent e-mail invitations to access the web-based questionnaire. The e-mail invitation indicated the purpose and procedures of the study. Phase 1 participants were informed that there would be two rounds of web-based questionnaires. Invitees of both phases were made aware that participation was completely voluntary and that all information was kept confidential. The e-mail included the URL of the study (http://www.mobilereadiness.info) and a temporary username and password, with which participants were taken to the consent form (see Appendix A).

Since the number of expert participants for Phase 1 was significantly smaller than the one for Phase 2, e-mails were sent directly to the experts using a personal e-mail program. For Phase 2, however, we utilized a mass e-mail software tool, Mach5 Mail, to facilitate the distribution of over 300 e-mails. The software tool enables the researcher to provide a customized e-mail message to each participant and rapidly send out a bulk number of e-mails.

After agreeing to participate, users were then taken to the main page of the study. The main page of the web-based expert study provided a central access point to the nine sections of the questionnaire. The progress status for each section was displayed by a representative icon, reminding participants which sections were not started, in progress or completed. Participants were instructed to answer all questions in Sections (1) - (8);

Section (9) was advised to be optional. Participants were also instructed that completion of sections could be done in any order they would like, providing more flexibility to the respondent. The use of a username and password to access the web-based study also enabled participants to allocate time to complete the survey on their own terms. If users could not complete the survey in one sitting, they were advised to save their responses, logout, and return to their questionnaire at any time by signing in with their user ID and password. Upon completion of all sections, participants were asked to click on the finish expert survey button. This provided a confirmation to both the participant and the principal investigators that a user had completed a survey.

The layout of Phase 2 was similar to the Phase 1 questionnaire. This phase, however, consisted of four sections. Phase 1 and 2 of the expert study were administered for 10 days and two weeks, respectively. One week after the initial e-mail invitation, a reminder e-mail was sent to those participants who had not responded yet.

6.5. Human Subjects Review

It is imperative that a researcher protects the rights of the participants of a research study and those of the institution in which the study is conducted. A researcher should also ensure that the scientific integrity of the study is maintained (Plant & Pons, 2006). In order to do so, all studies involving human subjects must undergo an institutional review board (IRB) approval process.

Prior to obtaining informed consent from the respondents, the principal investigators explained the nature and purpose of the study. The procedure to be following when completing the web-based survey was explained in detail (see Appendix). The participants were assured that no risks were involved in participating in this expert study and that their responses would be kept confidential. The respondents were not obliged to participate in the study, as one of the principles of the ethical conduct in research is that participation in research studies should be voluntary. Respondents were informed that participation in the expert study was voluntary and that failure to comply would result in any penalties. They were assured that they could withdraw even after consenting to cooperate in the research. The respondents were furnished with contact information, so that they could contact the principal investigators in the event of further questions, comments, or complaints.

Confidentiality and anonymity are very important in this type of study (Plant & Pons, 2006). Since the study was conducted entirely online, data was ensured to be kept secure and only accessible by the principal investigators. Participants were assured that their personal information and responses to the expert study were kept confidential and that their responses were only presented in aggregate form in the dissertation. The respondents were assured that confidentiality would be maintained throughout the study.

Scientific integrity was maintained by the acknowledgement of all sources in the literature review. Data was collected after the IRB approved the instrument and procedures, and the instrument was tested for its validity and reliability.

6.6. Summary

This chapter presented a detailed description of the research design of this study. It focused on the theoretical purpose and justification of the methodology chosen, instrument development, identification and selection of participants, and ethical consideration applied in this study. The next chapter presents the data analysis techniques used and discusses the resulting findings in relation to the research objective of this study.

CHAPTER 7:

DATA ANALYSIS AND RESULTS

7.1. Introduction

This chapter presents the data analysis and results of our expert study on enterprise readiness for mobile ICT. The data were collected and analyzed in response to our initial research questions presented in Chapter 1 of this dissertation. Two primary objectives drove the collection of this data and the subsequent data analysis. The first objective was to determine the relative importance of the eight enterprise readiness dimensions identified in Chapter 5. The second objective was to get determine the relative importance of assessment areas associated to these readiness dimensions. This knowledge furthers our understanding on what constitutes enterprise readiness for mobile ICT and provides a basis for merging theory and practice on emerging ICT management.

In the following sections of this chapter we present our initial data assumptions and preliminary data analyses, an examination of both main and interaction effects of our readiness dimensions, and in-depth investigation of the eight readiness dimension, and a comparison of various sample segments. The analysis of our data was coded and manipulated with the use of Microsoft Excel (XP) and Minitab (Version 14) on a Pentium 4 533Ghz (1GB).

7.2. Data Assumptions and Preliminary Data Analysis

7.2.1. Data Integrity

Conventional surveys often have the problem that respondents skip certain questions. A web-based approach, however, enables researchers to implement scripts that prevent item-skipping by respondents on all required questions. The result of this functionality was an absence of missing data.

The use of scripts to prevent missing data is not without limitations. Because it forces participants to answer all questions, it may force respondents to give answers for things they wish not to. In addition, this imposed force can also result in premature exit from the questionnaire as a way for subjects to avoid answering questions they are reluctant to answer. Indeed, this functionality resulted in a number of respondents registering for the web-based survey, but not completing the entire survey.

7.2.2. Non-Response Bias

Non-response bias is also often an issue an empirical research. Using an extrapolation method introduced by (Armstrong & Overton, 1977), non-response bias was found not to be a problem. In particular, we assessed non -response bias by testing for differences between early and late responders to the survey (first 10% and last 10% of responses) on the basis that late responders would be most similar to non-respondents (Armstrong & Overton, 1977). Using the Mann-Whitney "U" test, no significant ($p<0.05$) differences were found between the two sets of data, suggesting that non-response bias was unlikely.

7.2.3. Residual Analysis

Another important precursor to the data analysis of regression models is the examination of residuals. A careful examination of residuals enables us to verify whether our assumptions are reasonable and our choice of model is appropriate. Residuals are elements of variation unexplained by the fitted model. Since this is a form of error, the same general assumptions apply to the group of residuals that we typically use for errors in general: one expects them to be (roughly) normal and (approximately) independently distributed with a mean of 0 and some constant variance (Kutner, Nachtsheim, & Neter, 2004).

There are several analytical and graphical ways to examine these assumptions; for the purposes of our research, we use a graphical approach, namely a histogram, to judge the normality of the distribution of residuals. The histogram is a frequency plot obtained by placing the data in regularly spaced cells and plotting each cell frequency versus the center of the cell (Kutner et al., 2004). If a superimposed normal density function reflects the histogram, there is no departure from normality. Since the residuals in the histogram appear to be close to following a normal distribution, transforming the response or predictor variables did not make logical sense.

Another important step in our pre-analysis is to check for correlations between residuals. There are several correlation structures that can be used; the one used for our research purpose is compound symmetry (CS). This structure says that the correlations between all pairs of measures are the same. This assumption is not unreasonable when the repeated measures arise from different sets of conditions, such as the response to different treatments (in our case profiles). Using the maximum likelihood estimation (MLE) method to estimate the covariance structure, we found that the correlations of the residuals are approximately zero, in other words, $\hat{\rho} = 0$

Thus, significant improvements to the R^2 are not expected to be made by using an alternate analysis method, such as a repeated measures or ordinal logit regression analysis. However, refinements in the corresponding p-values may result when using these alternate approaches. This is kept as a future research direction for further insight.

7.2.4. Power Analysis

In order to avoid the perils of insufficient data, power analysis is necessary to ensure that the sample size of our study is large enough so that the statistical tests can actually detect the differences that they purport to find. If the sample size is too low, the standard statistical tests will not have the statistical power to detect differences that really exist. What happens in these cases is that no significant difference is found, although in reality such a difference exists. With the decline in sample size, the probability of acceptance of a false null hypothesis, sometimes referred to as beta, increases under such circumstances. Since our sample size of n=109 is relatively large for our type of analysis and parameter estimates have small variances, we can conclude that we are able to detect a significant difference.

7.3. Enterprise Readiness: Analysis and Results

In Section 3 of Phase, we asked participants to evaluate 27 enterprise readiness profiles that displayed all eight dimension at varying levels on a five-point Likert scale (1=very low, 5= very high). All enterprise readiness profiles used in this Section are shown in Appendix B. We then computed the average response for each of the 27 enterprise readiness profiles (as shown in the Average Response column in Table 27). The resulting average z-value is shown in the z column in Table 133. Table 133 further shows the design matrix of our fractional factorial experiment.

Table 27. Average Response w/ Design Matrix

Profile	Average Response	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.450	1	1	1	1	1	1	1	1
2	2.550	1	1	2	1	2	2	3	3
3	3.009	1	1	3	1	3	3	2	2
4	2.761	1	2	1	2	2	3	1	2
5	2.761	1	2	2	2	3	1	3	1
6	2.936	1	2	3	2	1	2	2	3
7	3.138	1	3	1	3	3	2	1	3
8	3.422	1	3	2	3	1	3	3	2
9	2.963	1	3	3	3	2	1	2	1
10	2.606	2	1	1	2	2	2	2	1
11	3.229	2	1	2	2	3	3	1	3
12	2.679	2	1	3	2	1	1	3	2
13	2.881	2	2	1	3	3	1	2	2
14	2.771	2	2	2	3	1	2	1	1
15	4.239	2	2	3	3	2	3	3	3
16	3.055	2	3	1	1	1	3	2	3
17	2.578	2	3	2	1	2	1	1	2
18	3.633	2	3	3	1	3	2	3	1
19	3.743	3	1	1	3	3	3	3	1
20	2.789	3	1	2	3	1	1	2	3
21	3.211	3	1	3	3	2	2	1	2
22	2.807	3	2	1	1	1	2	3	2
23	3.394	3	2	2	1	2	3	2	1
24	3.101	3	2	3	1	3	1	1	3
25	3.193	3	3	1	2	2	1	3	3
26	3.872	3	3	2	2	3	2	2	2
27	3.477	3	3	3	2	1	3	1	1

In order to obtain our regression model for our full sample, we regressed the Average Response against our eight readiness dimensions. This resulted in the following regression equation and statistics.

```
Regression Equation
Average (Full) = - 0.344 + 0.255 Tech + 0.226 DataInfo + 0.201 Proc + 0.199
Know + 0.221 Res + 0.330 Lead + 0.184 Empl + 0.0796 ValGoals


Predictor      Coef  SE Coef      T      P
Constant    -0.3442   0.1180  -2.92  0.009
Tech        0.25539  0.02064  12.37  0.000
DataInfo    0.22583  0.02064  10.94  0.000
Proc        0.20078  0.02064   9.73  0.000
Know        0.19889  0.02064   9.63  0.000
Res         0.22117  0.02064  10.71  0.000
Lead        0.32967  0.02064  15.97  0.000
Empl        0.18394  0.02064   8.91  0.000
ValGoals    0.07956  0.02064   3.85  0.001


S = 0.0875818   R-Sq = 98.1%   R-Sq(adj) = 97.2%


Analysis of Variance

Source          DF       SS       MS       F      P
Regression       8  7.08934  0.88617  115.53  0.000
Residual Error  18  0.13807  0.00767
Total           26  7.22741
```

Sometimes it is not necessary or desirable to include all possible variables in a regression equation. Selection of the appropriate variables should thus give an insight into the most relevant variables. The aim in variable selection is two-fold

1. Obtain as simple a model as possible which will give accurate predictions.
2. Explain which variables affect the dependent variable and in what way.

There are a number of methods for selecting the appropriate variables. The most common ones are described below

- **Backward Elimination.** Backward elimination starts by including all possible variables in the equation and omits the variables one by one.

- **Forward Selection.** Forward selection begins by regressing the dependent variable on just one other variable and then variables are added one at a time. The first variable to be entered is the one with the highest correlation with the dependent variable.

- **Stepwise regression.** The stepwise procedure starts in the same way as the forward selection procedure. Whenever a regressor is added the backward elimination procedure is used on the variables already in the equation. In this way it can be determined whether or not any regressor previously selected is now redundant due to the inclusion of another regressor or to the combination of certain regressors.

- **Best Subsets Regression.** Another approach to variable selection is to fit all possible regression equations and then to decide which is the best model. The results are summarized in terms of R-sq, R-sq (adj) and Mallow's Cp.

For the purposes of our analysis we used forward selection (with alpha-to-enter: 0.25) and the best subset method for comparison. This resulted in the following output:

Forward selection. Alpha-to-Enter: 0.25

Response is Average (Full) on 8 predictors, with N = 27

Step	1	2	3	4	5	6	7	8
Constant	2.3869	1.8761	1.4244	0.9821	0.5806	0.1828	-0.1851	-0.3442
Lead	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.330
T-Value	3.05	3.39	3.76	4.33	5.11	6.74	12.14	15.97
P-Value	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000
Tech		0.255	0.255	0.255	0.255	0.255	0.255	0.255
T-Value		2.62	2.91	3.35	3.96	5.22	9.41	12.37
P-Value		0.015	0.008	0.003	0.001	0.000	0.000	0.000
DataInfo			0.226	0.226	0.226	0.226	0.226	0.226
T-Value			2.58	2.96	3.50	4.62	8.32	10.94
P-Value			0.017	0.007	0.002	0.000	0.000	0.000
Res				0.221	0.221	0.221	0.221	0.221
T-Value				2.90	3.43	4.52	8.15	10.71
P-Value				0.008	0.003	0.000	0.000	0.000
Proc					0.201	0.201	0.201	0.201
T-Value					3.11	4.11	7.40	9.73
P-Value					0.005	0.001	0.000	0.000
Know						0.199	0.199	0.199
T-Value						4.07	7.33	9.63
P-Value						0.001	0.000	0.000
Empl							0.184	0.184
T-Value							6.78	8.91
P-Value							0.000	0.000
ValGoals								0.080
T-Value								3.85
P-Value								0.001
S	0.459	0.413	0.372	0.323	0.274	0.207	0.115	0.0876
R-Sq	27.07	43.31	56.01	68.20	78.23	88.09	96.51	98.09
R-Sq(adj)	24.15	38.59	50.28	62.41	73.05	84.51	95.23	97.24
Mallows C-p	664.2	513.1	395.5	282.7	190.1	99.3	21.9	9.0

Best Subsets. Response is Average (Full)

Vars	R-Sq	R-Sq(adj)	Mallows C-p	S	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	27.1	24.1	664.2	0.45918						X		
1	16.2	12.9	766.2	0.49207	X							
2	43.3	38.6	513.1	0.41318	X					X		
2	39.8	34.7	546.5	0.42589		X				X		
3	56.0	50.3	395.5	0.37178	X	X				X		
3	55.5	49.7	400.4	0.37397	X				X	X		
4	68.2	62.4	282.7	0.32324	X	X			X	X		
4	66.1	59.9	302.9	0.33395	X	X	X			X		
5	78.2	73.1	190.1	0.27369	X	X	X		X	X		
5	78.0	72.8	191.8	0.27487	X	X		X	X	X		
6	88.1	84.5	99.3	0.20749	X	X	X	X	X	X		
6	86.7	82.7	112.7	0.21955	X	X	X		X	X	X	
7	96.5	95.2	21.9	0.11516	X	X	X	X	X	X	X	
7	89.7	85.9	86.4	0.19830	X	X	X	X	X	X		X
8	98.1	97.2	9.0	0.087582	X	X	X	X	X	X	X	X

Both forward selection and best subsets confirms our initial regression model, and we feel confident that the results are valid. From all three approaches we can see that the variance explained by the variables included in the model is very high (R-sq: 98.1%). In order to see the effect of each variable in this model and verify our hypotheses set in Chapter 5, we can take a closer look at the main effect plot shown in Figure 37.

Indeed, all dimensions have a positive effect on enterprise readiness. We can also observe that with higher levels of dimensional readiness, enterprise readiness increases. Leadership has the steepest slope, indicating that it has the largest effect on enterprise readiness. The flattest main effect is Values & Goals, indicating that it has the smallest effect on enterprise readiness.

In order to determine the contribution of each dimension on enterprise readiness, we can utilize the ANOVA table. Dividing the Adjusted SS by the Total, will provide us the contribution for each dimension.

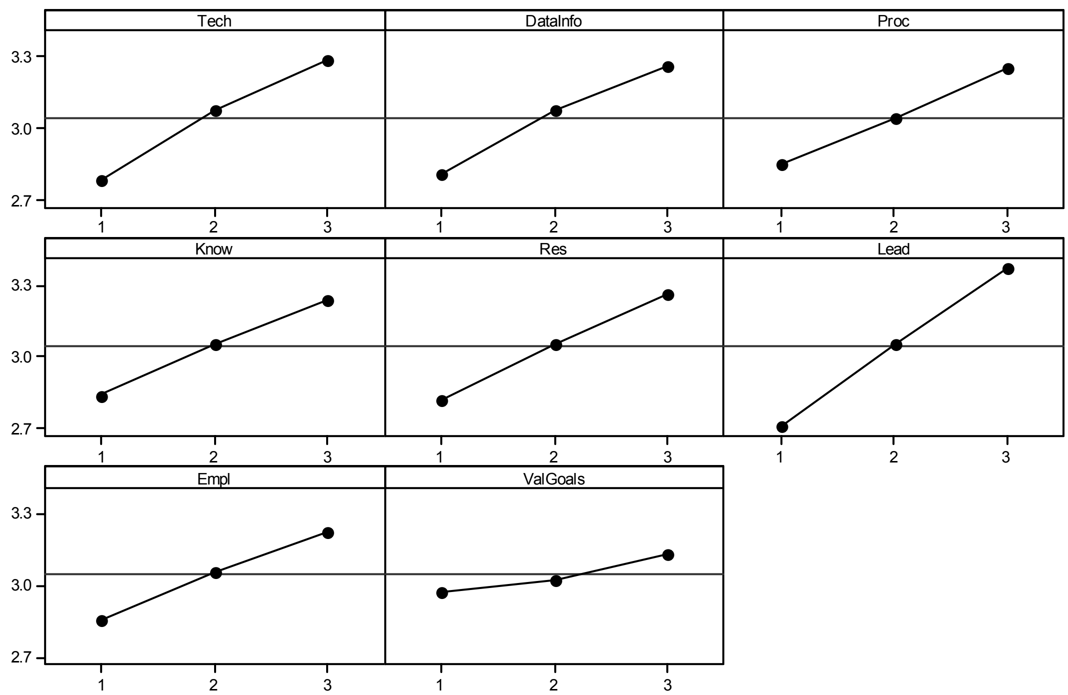


Figure 37. Main Effects Graph (Data Means) for Average (Full Sample)

Analysis of Variance for Average (Full), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.18486	1.18486	0.59243	56.26	0.000
DataInfo	2	0.92722	0.92722	0.46361	44.03	0.000
Proc	2	0.72603	0.72603	0.36301	34.47	0.000
Know	2	0.71362	0.71362	0.35681	33.88	0.000
Res	2	0.88150	0.88150	0.44075	41.86	0.000
Lead	2	1.95819	1.95819	0.97909	92.98	0.000
Empl	2	0.61036	0.61036	0.30518	28.98	0.000
ValGoals	2	0.12033	0.12033	0.06016	5.71	0.022
Error	10	0.10530	0.10530	0.01053		
Total	26	7.22741				

Figure 38 provides an illustration of the contribution of each dimension on enterprise readiness for the full sample.

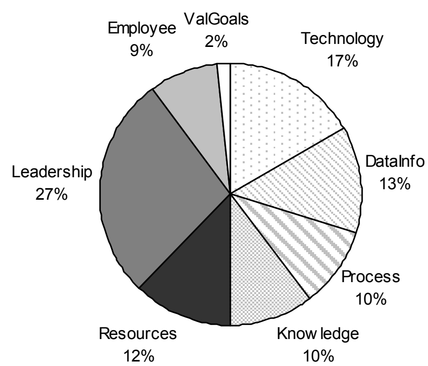


Figure 38. Dimensional Contribution on Enterprise Readiness (Full Sample)

Similar to analyzing the main effects, we are also interested in the interaction effects of the eight dimensions. In order to determine the interaction effects, we generate the interaction plot shown in Figure 39. The interaction plot, however, does not reveal any significant interactions.

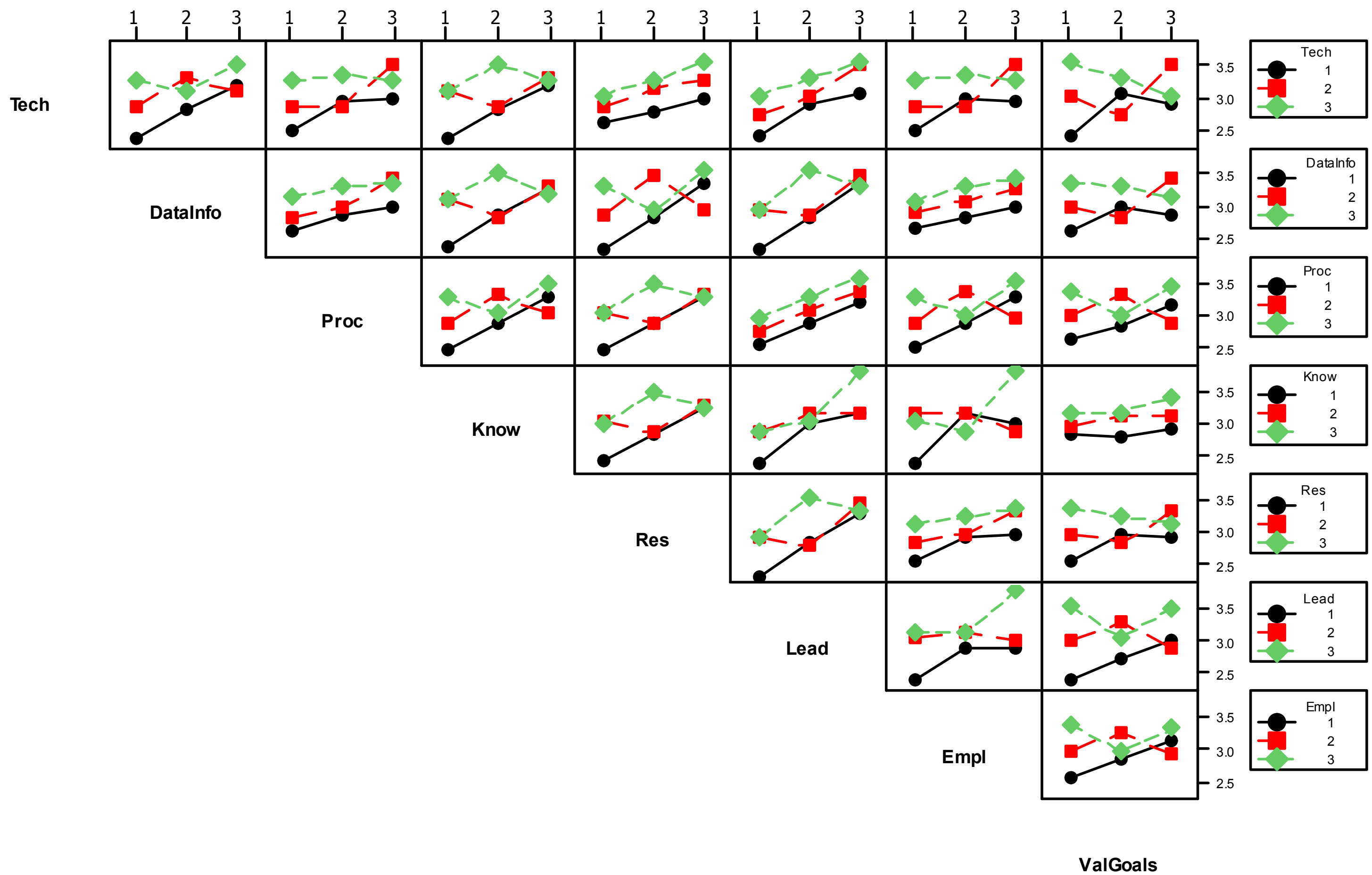
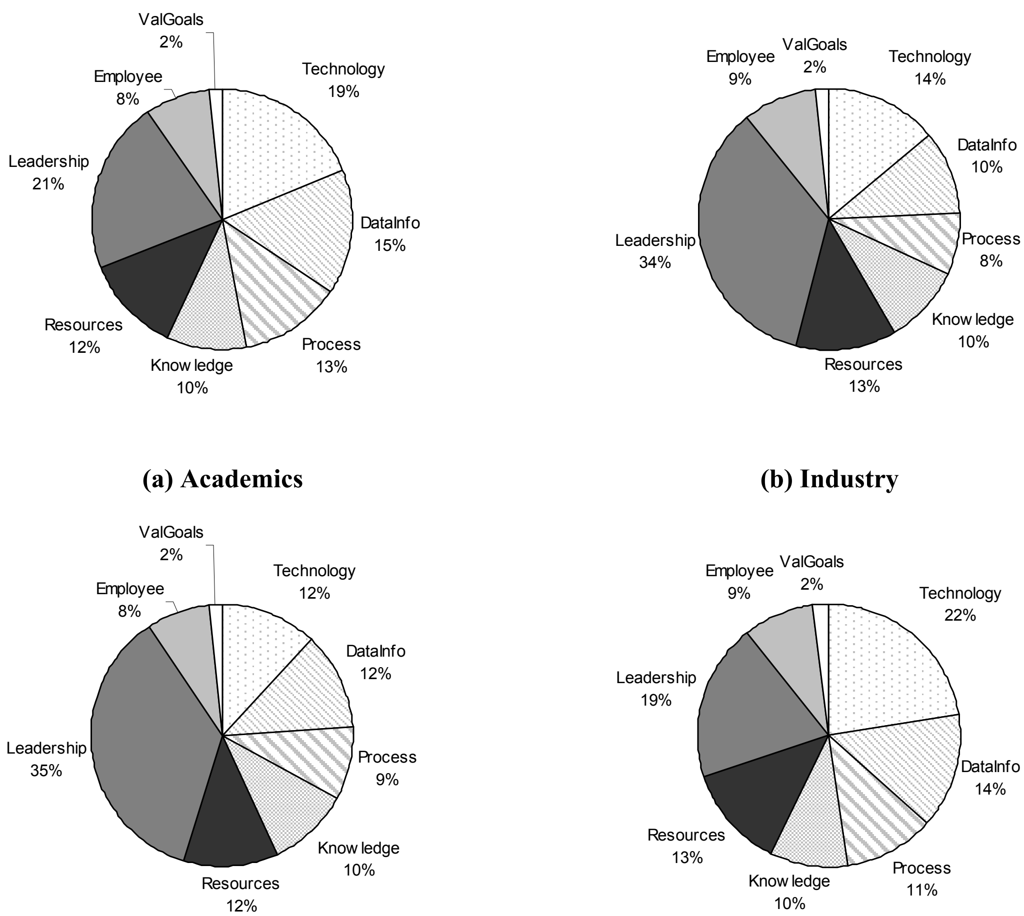


Figure 39. Interaction Graph (Data Means) for Average (Full Sample)

7.4. Group Comparisons

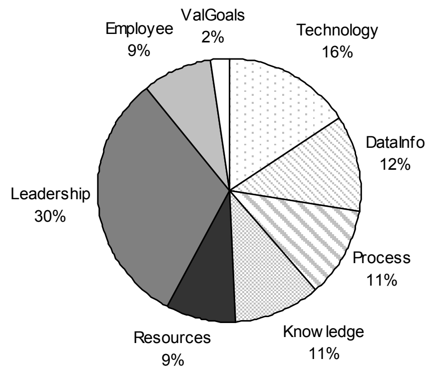
In order to determine whether the sample segment groups and/or their dimensions differ significantly, we conducted a group comparisons analysis. Similar to our previous analysis, we also determined the contribution of each dimension for each sample segment. Figure 40 provides an overview to that.



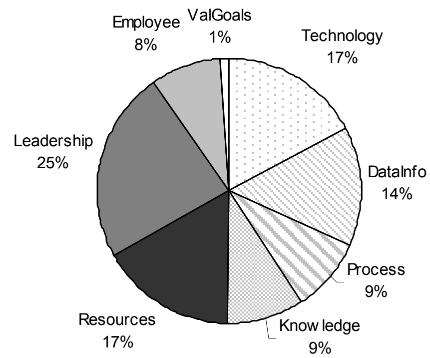
(a) Academics **(b) Industry**

(c) US **(d) Global**

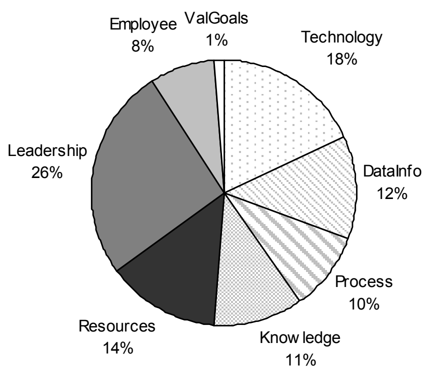
Figure 40. Contribution of Dimension on Enterprise Readiness (a-d)



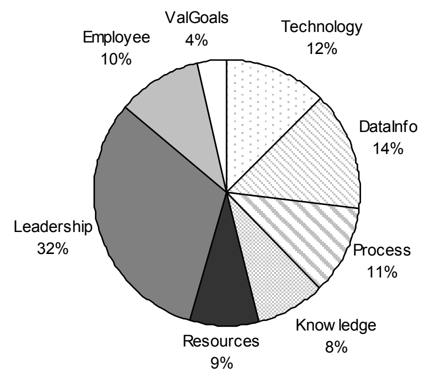
(e) Small



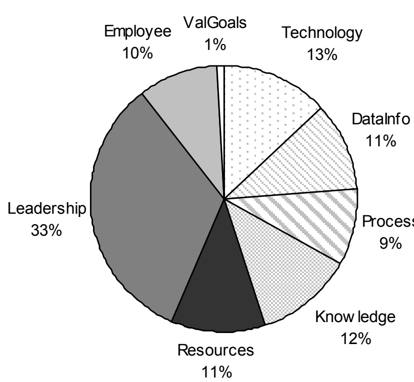
(f) Large



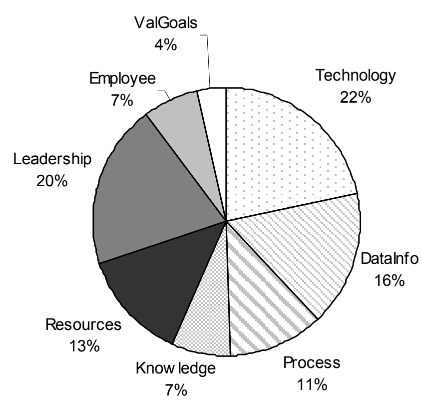
(g) Mobile ICT Deployed



(h) Mobile ICT Not Deployed



(i) Mobile ICT Strategy



(j) No Mobile ICT Strategy

Figure 40. (continued)

Comparison between the two charts within each sample segment indicates that there are potentially some significant differences.

The first step in determining significance between two sample segments was to set up a large array of our response variable and design matrix. Table 28 shows an excerpt of this array. The full array can be found in Appendix C

Table 28. Observed and Predicted Response, Residuals, Design Matrix

		Resp.	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals	Pred	Residual
1	1	2	1	1	1	1	1	1	1	1	1.3514	0.6486
1	2	3	1	1	2	1	2	2	3	3	2.6304	0.3696
1	3	2	1	1	3	1	3	3	2	2	3.1189	-1.1189
1	4	3	1	2	1	2	2	3	1	2	2.7369	0.2631
1	5	3	1	2	2	2	3	1	3	1	2.7874	0.2126
1	6	2	1	2	3	2	1	2	2	3	2.8514	-0.8514
…	…	…	…	…	…	…	…	…	…	…	…	…
1	27	4	3	3	3	2	1	3	1	1	3.5744	0.4256
2	1	2	1	1	1	1	1	1	1	1	1.3514	0.6486
2	2	2	1	1	2	1	2	2	3	3	2.6304	-0.6304
2	3	3	1	1	3	1	3	3	2	2	3.1189	-0.1189
2	4	3	1	2	1	2	2	3	1	2	2.7369	0.2631
2	5	3	1	2	2	2	3	1	3	1	2.7874	0.2126
2	6	3	1	2	3	2	1	2	2	3	2.8514	0.1486
…	…	…	…	…	…	…	…	…	…	…	…	…
2	27	5	3	3	3	2	1	3	1	1	3.5744	1.4256
…	…	…	…	…	…	…	…	…	…	…	…	…
109	1	2	1	1	1	1	1	1	1	1	1.3514	0.6486
109	2	3	1	1	2	1	2	2	3	3	2.6304	0.3696
109	3	4	1	1	3	1	3	3	2	2	3.1189	0.8811
109	4	4	1	2	1	2	2	3	1	2	2.7369	1.2631
109	5	4	1	2	2	2	3	1	3	1	2.7874	1.2126
109	6	4	1	2	3	2	1	2	2	3	2.8514	1.1486
…	…	…	…	…	…	…	…	…	…	…	…	…
109	27	5	3	3	3	2	1	3	1	1	3.5744	1.4256

We then regressed the response variable against the design matrix. This resulted in the following regression equation:

```
Regression Equation

Response = - 0.344 + 0.255 Tech + 0.226 DataInfo + 0.201 Proc + 0.199 Know
           + 0.221 Res + 0.330 Lead + 0.184 Empl + 0.0795 ValGoals
```

Next, we used this regression equation to determine the predicted response for each case, and then determined the residual as follows:

$$Residual_i = Response_i - Predicted\ Response_i$$

Most group analyses require the use of a binomial, or categorical, predictor. Because categorical predictor (independent) variables cannot be entered directly into a regression model and be meaningfully interpreted, some other method of dealing with information of this type must be developed (Kutner et al., 2004). In general, a categorical variable with k levels will be transformed into k-1 variables each with two levels. For example, if a categorical variable had six levels, then five dichotomous variables could be constructed that would contain the same information as the single categorical variable. Dichotomous variables have the advantage that they can be directly entered into the regression model. The process of creating dichotomous variables from categorical variables is called dummy coding (Montgomery, 2000).

Depending upon how the dichotomous variables are constructed, additional information can be gleaned from the analysis. In addition, careful construction will result in uncorrelated dichotomous variables. As discussed earlier, these variables have the advantage of simplicity of interpretation and are preferred to correlated predictor variables.

Since our group variables had 2 levels, only one dummy variable has to be created per group comparison. Thus, we included dummy coded variables to represent each of the five groups using binary variables as follows:

```
G1: Academics vs. Industry
IF G1="0" THEN Academics, IF G1="1" THEN Industry

G2: US vs. Global
IF G1="0" THEN US, IF G1="1" THEN Global

G3: Small vs. Large
IF G1="0" THEN Small, IF G1="1" THEN Large

G4: Mobile ICT Deployed vs. Mobile ICT Not Deployed
IF G1="0" THEN Mobile ICT Deployed, IF G1="1" THEN Mobile ICT Not Deployed

G5: Mobile ICT Strategy vs. No Mobile ICT Strategy
IF G1="0" THEN Mobile ICT Strategy, IF G1="1" THEN No Mobile ICT Strategy
```

Since we not only wanted to determine group differences, but also dimensional differences between groups, we had to include interaction terms in our regression model. Thus, we included the interaction terms between the main (dimensional) (Tech-ValGoals) and group variables (G1-G5), which resulted in 40 interaction terms. A schematic representation of our input data is depicted in Table 29.

Table 29. Group and Group Interaction Design Matrix

Resp	Profile	Residual	G1	G2	G3	G4	G5	G1* Tech	G1* Data Info	G1* Proc	G1* Know	…	G5* ValGoals
1	1	0.6486	0	0	0	0	0	0	0	0	0	…	0
1	2	0.3696	0	0	0	0	0	0	0	0	0	…	0
1	3	-1.1189	0	0	0	0	0	0	0	0	0	…	0
1	4	0.2631	0	0	0	0	0	0	0	0	0	…	0
1	5	0.2126	0	0	0	0	0	0	0	0	0	…	0
1	6	-0.8514	0	0	0	0	0	0	0	0	0	…	0
…	…	…	…	…	…	…	…	…	…	…	…	…	…
1	27	0.4256	0	0	0	0	0	0	0	0	0	…	0
2	1	0.6486	1	0	1	1	1	1	1	1	1	…	1
2	2	-0.6304	1	0	1	1	1	1	1	2	1	…	3
2	3	-0.1189	1	0	1	1	1	1	1	3	1	…	2
2	4	0.2631	1	0	1	1	1	1	2	1	2	…	2
2	5	0.2126	1	0	1	1	1	1	2	2	2	…	1
2	6	0.1486	1	0	1	1	1	1	2	3	2	…	3
…	…	…	…	…	…	…	…	…	…	…	…	…	…
2	27	1.4256	1	0	1	1	1	3	3	2	2	…	1
…	…	…	…	…	…	…	…	…	…	…	…	…	…
109	1	0.6486	1	1	0	1	1	1	1	1	1	…	1
109	2	0.3696	1	1	0	1	1	1	1	2	1	…	3
109	3	0.8811	1	1	0	1	1	1	1	3	1	…	2
109	4	1.2631	1	1	0	1	1	1	2	1	2	…	2
109	5	1.2126	1	1	0	1	1	1	2	2	2	…	1
109	6	1.1486	1	1	0	1	1	1	2	3	2	…	3
…	…	…	…	…	…	…	…	…	…	…	…	…	…
109	27	1.4256	1	1	0	1	1	3	3	3	2	…	1

We then used stepwise forward selection regression between the residual as our response variable against the dummy coded group variables and these interaction terms and ensured that the five main group variables (G1 – G5) are included in every model. We obtained the following output:

```
Forward selection.  Alpha-to-Enter: 0.25

Response is Residual on 45 predictors, with N = 2943


Step                 1         2         3         4         5         6
Constant      -0.07253  -0.07253  -0.07253  -0.07253  -0.07253  -0.07253

G1               0.035     0.035     0.035    -0.048    -0.169    -0.103
T-Value           1.10      1.10      1.10     -0.84     -2.27     -1.35
P-Value          0.271     0.270     0.270     0.401     0.023     0.178

G2               0.178     0.045    -0.036    -0.036    -0.036    -0.036
T-Value           6.14      0.78     -0.57     -0.57     -0.57     -0.57
P-Value          0.000     0.437     0.571     0.571     0.571     0.570

G3               0.012     0.012     0.012     0.012     0.012     0.012
T-Value           0.43      0.43      0.43      0.43      0.43      0.43
P-Value          0.666     0.666     0.665     0.665     0.665     0.664

G4              -0.100    -0.100    -0.100    -0.100     0.036     0.209
T-Value          -2.55     -2.56     -2.56     -2.56      0.55      2.48
P-Value          0.011     0.011     0.011     0.011     0.582     0.013

G5               0.077     0.077     0.221     0.221     0.221    -0.057
T-Value           2.21      2.22      3.66      3.66      3.67     -0.55
P-Value          0.027     0.027     0.000     0.000     0.000     0.583

G2*Tech                    0.067     0.107     0.107     0.107     0.107
T-Value                     2.68      3.77      3.77      3.77      3.78
P-Value                    0.007     0.000     0.000     0.000     0.000

G5*Tech                             -0.072    -0.072    -0.072    -0.072
T-Value                              -2.92     -2.92     -2.92     -2.93
P-Value                              0.004     0.004     0.004     0.003

G1*Lead                                        0.041     0.102     0.069
T-Value                                         1.72      3.01      1.97
P-Value                                        0.086     0.003     0.049

G4*Lead                                                 -0.068    -0.155
T-Value                                                  -2.55     -4.13
P-Value                                                  0.011     0.000

G5*Lead                                                            0.139
T-Value                                                             3.30
P-Value                                                            0.001
```

S	0.732	0.732	0.731	0.730	0.730	0.729
R-Sq	1.46	1.70	1.99	2.09	2.30	2.66
R-Sq(adj)	1.29	1.50	1.75	1.82	2.00	2.33
Mallows C-p	33.2	27.9	21.4	20.4	15.9	7.0
Step	7	8	9	10	11	12
Constant	-0.07253	-0.07253	-0.07253	-0.07253	-0.07253	-0.07253
G1	-0.103	-0.103	-0.046	-0.025	-0.025	-0.025
T-Value	-1.35	-1.35	-0.50	-0.27	-0.27	-0.27
P-Value	0.178	0.178	0.614	0.783	0.783	0.783
G2	0.004	0.004	0.004	-0.071	-0.071	-0.071
T-Value	0.06	0.06	0.06	-0.83	-0.83	-0.83
P-Value	0.953	0.953	0.953	0.409	0.409	0.409
G3	0.012	-0.052	-0.052	-0.052	-0.087	-0.087
T-Value	0.43	-0.97	-0.97	-0.97	-1.42	-1.42
P-Value	0.664	0.332	0.332	0.332	0.155	0.155
G4	0.08	0.08	0.08	0.08	0.08	0.08
T-Value	0.69	0.69	0.69	0.69	0.69	0.69
P-Value	0.493	0.493	0.493	0.493	0.493	0.492
G5	0.05	0.05	0.05	0.05	0.11	0.16
T-Value	0.42	0.42	0.42	0.42	0.85	1.17
P-Value	0.677	0.677	0.677	0.677	0.398	0.240
G2*Tech	0.087	0.087	0.087	0.087	0.087	0.087
T-Value	2.83	2.83	2.83	2.83	2.83	2.83
P-Value	0.005	0.005	0.005	0.005	0.005	0.005
G5*Tech	-0.126	-0.126	-0.126	-0.126	-0.126	-0.126
T-Value	-3.11	-3.11	-3.11	-3.11	-3.11	-3.11
P-Value	0.002	0.002	0.002	0.002	0.002	0.002
G1*Lead	0.069	0.069	0.069	0.069	0.069	0.069
T-Value	1.97	1.97	1.97	1.97	1.97	1.97
P-Value	0.049	0.049	0.049	0.049	0.049	0.049
G4*Lead	-0.155	-0.155	-0.155	-0.155	-0.155	-0.155
T-Value	-4.13	-4.13	-4.13	-4.14	-4.14	-4.14
P-Value	0.000	0.000	0.000	0.000	0.000	0.000
G5*Lead	0.139	0.139	0.139	0.139	0.139	0.139
T-Value	3.30	3.30	3.30	3.30	3.30	3.30
P-Value	0.001	0.001	0.001	0.001	0.001	0.001
G4*Tech	0.065	0.065	0.065	0.065	0.065	0.065
T-Value	1.67	1.67	1.67	1.68	1.68	1.68
P-Value	0.094	0.094	0.094	0.094	0.094	0.094
G3*Res		0.032	0.032	0.032	0.049	0.049
T-Value		1.39	1.39	1.39	1.82	1.82
P-Value		0.163	0.163	0.163	0.069	0.069
G1*Proc			-0.029	-0.039	-0.039	-0.039
T-Value			-1.20	-1.56	-1.56	-1.56
P-Value			0.229	0.119	0.119	0.119

G2*Proc				0.037	0.037	0.037
T-Value				1.44	1.44	1.44
P-Value				0.149	0.149	0.149
G5*Res					-0.030	-0.030
T-Value					-1.20	-1.20
P-Value					0.231	0.231
G5*ValGoals						-0.026
T-Value						-1.20
P-Value						0.231
S	0.728	0.728	0.728	0.728	0.728	0.728
R-Sq	2.76	2.82	2.87	2.94	2.99	3.03
R-Sq(adj)	2.39	2.42	2.44	2.47	2.49	2.50
Mallows C-p	6.2	6.3	6.9	6.8	7.3	7.9

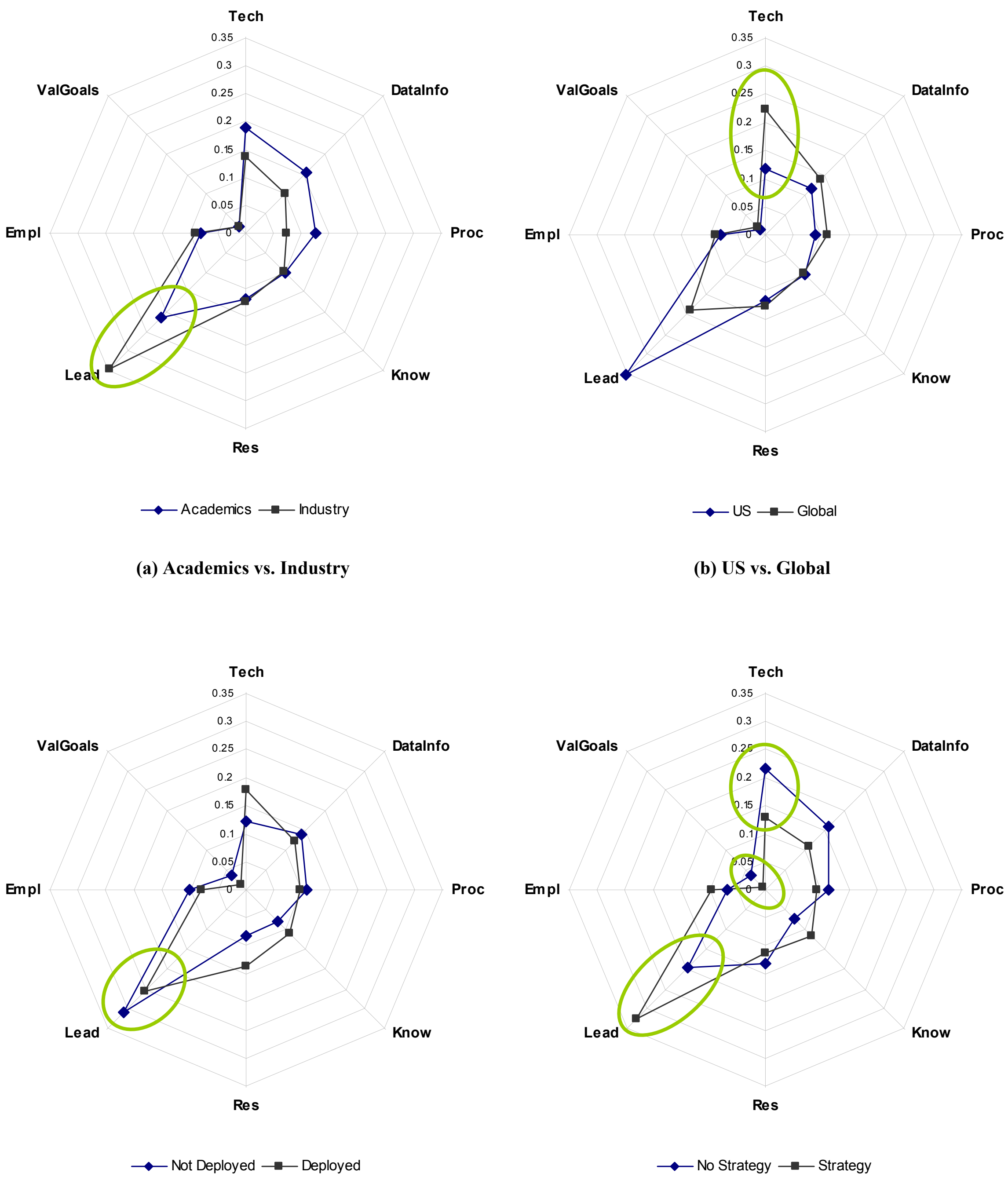
Step	13	14	15	16
Constant	-0.07253	-0.07253	-0.07253	-0.07253
G1	-0.11	-0.12	-0.12	-0.12
T-Value	-0.99	-1.06	-1.06	-1.06
P-Value	0.321	0.291	0.291	0.291
G2	-0.071	-0.138	-0.195	-0.238
T-Value	-0.83	-1.35	-1.71	-2.03
P-Value	0.409	0.179	0.087	0.042
G3	-0.087	-0.087	-0.087	-0.087
T-Value	-1.42	-1.42	-1.42	-1.42
P-Value	0.155	0.155	0.155	0.155
G4	0.08	0.08	0.08	0.08
T-Value	0.69	0.69	0.69	0.69
P-Value	0.492	0.492	0.492	0.492
G5	0.22	0.25	0.25	0.33
T-Value	1.50	1.70	1.70	2.10
P-Value	0.133	0.089	0.089	0.036
G2*Tech	0.087	0.087	0.087	0.087
T-Value	2.83	2.83	2.83	2.83
P-Value	0.005	0.005	0.005	0.005
G5*Tech	-0.126	-0.126	-0.126	-0.126
T-Value	-3.11	-3.11	-3.11	-3.11
P-Value	0.002	0.002	0.002	0.002
G1*Lead	0.069	0.069	0.069	0.069
T-Value	1.97	1.97	1.97	1.97
P-Value	0.049	0.049	0.049	0.049
G4*Lead	-0.155	-0.155	-0.155	-0.155
T-Value	-4.14	-4.14	-4.14	-4.14
P-Value	0.000	0.000	0.000	0.000
G5*Lead	0.139	0.139	0.139	0.139
T-Value	3.30	3.30	3.30	3.30
P-Value	0.001	0.001	0.001	0.001

G4*Tech	0.065	0.065	0.065	0.065
T-Value	1.68	1.68	1.68	1.68
P-Value	0.094	0.094	0.094	0.094
G3*Res	0.049	0.049	0.049	0.049
T-Value	1.82	1.82	1.82	1.82
P-Value	0.069	0.069	0.069	0.069
G1*Proc	-0.039	-0.039	-0.039	-0.039
T-Value	-1.56	-1.56	-1.56	-1.56
P-Value	0.118	0.118	0.118	0.118
G2*Proc	0.037	0.037	0.037	0.037
T-Value	1.44	1.44	1.44	1.44
P-Value	0.149	0.149	0.149	0.149
G5*Res	-0.030	-0.030	-0.030	-0.030
T-Value	-1.20	-1.20	-1.20	-1.20
P-Value	0.231	0.231	0.231	0.231
G5*ValGoals	-0.053	-0.070	-0.070	-0.070
T-Value	-1.77	-2.10	-2.10	-2.10
P-Value	0.077	0.036	0.036	0.036
G1*ValGoals	0.044	0.048	0.048	0.048
T-Value	1.30	1.41	1.41	1.41
P-Value	0.193	0.159	0.159	0.159
G2*ValGoals		0.034	0.034	0.034
T-Value		1.19	1.19	1.19
P-Value		0.236	0.236	0.236
G2*DataInfo			0.029	0.050
T-Value			1.16	1.76
P-Value			0.248	0.078
G5*DataInfo				-0.038
T-Value				-1.54
P-Value				0.123
S	0.728	0.728	0.728	0.728
R-Sq	3.09	3.14	3.18	3.26
R-Sq(adj)	2.53	2.54	2.55	2.60
Mallows C-p	8.2	8.8	9.5	9.1

A closer look at this output indicates that only some groups and dimensional interactions are significant. These are discussed below and shown in Figure 41:

- **G1*Lead.** Within the academics and industry respondent comparison group, there is a significant difference in leadership evaluation (p=0.049)

- **G2.** There is a significant difference between US and Global respondents ($p=0.042$).
- **G2*Tech.** Within the US and Global respondent comparison group, technology is significantly different ($p=0.005$)
- **G4*Lead.** There is a significant difference in leadership evaluation between respondents from organizations that have deployed mobile ICT versus that have not ($p=0.000$)
- **G5.** There is a significant difference between organizations that have a mobile ICT strategy and those that do not ($p=0.036$).
- **G5*Tech.** There is a significant difference in technology evaluation between respondents from organizations that have a mobile ICT strategy and those that do not ($p=0.002$)
- **G5*Lead.** There is a significant difference in leadership evaluation between respondents from organizations that have a mobile ICT strategy and those that do not ($p=0.001$)
- **G5*ValGoals.** There is a significant difference in values and goals evaluation between respondents from organizations that have a mobile ICT strategy and those that do not ($p=0.036$)



(a) Academics vs. Industry

(b) US vs. Global

(c)Mobile ICT Deployed vs. Not Deployed

(d) Mobile ICT Strategy vs. No Strategy

Figure 41. Significant Group Differences (α=0.05)

7.5. Predictive Model of Enterprise Readiness

While the regression equation provides some predictive capability, its interpretation is a little difficult because the prediction does not necessarily fall between 1 and 5. It is therefore desirable to have the response of the enterprise readiness regression equation on the same five-point Likert scale in which respondents initially evaluated the profiles. In order to generate such a prediction equation, we transformed the response variable as follows:

$$z = \log\left(\frac{y-1}{5-y}\right)$$

Applying this transformation results in the matrix shown in Table 30. When regressing z on our eight readiness dimensions, we obtain the following predictive regression equation:

```
Regression equation
z (Full) = - 1.72 + 0.126 Tech + 0.112 DataInfo + 0.105 Proc + 0.105 Know
           + 0.111 Res + 0.162 Lead + 0.0987 Empl + 0.0503 ValGoals


Predictor      Coef  SE Coef       T      P
Constant   -1.72430  0.06667  -25.86  0.000
Tech        0.12628  0.01166   10.83  0.000
DataInfo    0.11239  0.01166    9.64  0.000
Proc        0.10472  0.01166    8.98  0.000
Know        0.10456  0.01166    8.96  0.000
Res         0.11133  0.01166    9.54  0.000
Lead        0.16244  0.01166   13.93  0.000
Empl        0.09867  0.01166    8.46  0.000
ValGoals    0.05028  0.01166    4.31  0.000


S = 0.0494868   R-Sq = 97.6%   R-Sq(adj) = 96.6%

Analysis of Variance

Source          DF       SS       MS      F      P
Regression       8  1.82740  0.22843  93.27  0.000
Residual Error  18  0.04408  0.00245
Total           26  1.87148
```

Table 30. Transformed Response w/ Design Matrix (Full Sample)

Profile	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	-0.898	1	1	1	1	1	1	1	1
2	-0.199	1	1	2	1	2	2	3	3
3	0.004	1	1	3	1	3	3	2	2
4	-0.104	1	2	1	2	2	3	1	2
5	-0.104	1	2	2	2	3	1	3	1
6	-0.028	1	2	3	2	1	2	2	3
7	0.060	1	3	1	3	3	2	1	3
8	0.186	1	3	2	3	1	3	3	2
9	-0.016	1	3	3	3	2	1	2	1
10	-0.174	2	1	1	2	2	2	2	1
11	0.100	2	1	2	2	3	3	1	3
12	-0.141	2	1	3	2	1	1	3	2
13	-0.052	2	2	1	3	3	1	2	2
14	-0.100	2	2	2	3	1	2	1	1
15	0.629	2	2	3	3	2	3	3	3
16	0.024	2	3	1	1	1	3	2	3
17	-0.186	2	3	2	1	2	1	1	2
18	0.285	2	3	3	1	3	2	3	1
19	0.339	3	1	1	3	3	3	3	1
20	-0.092	3	1	2	3	1	1	2	3
21	0.092	3	1	3	3	2	2	1	2
22	-0.084	3	2	1	1	1	2	3	2
23	0.174	3	2	2	1	2	3	2	1
24	0.044	3	2	3	1	3	1	1	3
25	0.084	3	3	1	2	2	1	3	3
26	0.406	3	3	2	2	3	2	2	2
27	0.211	3	3	3	2	1	3	1	1

The stepwise forward regression and best subsets approach validates our model. The output of this approach is presented below:

```
Forward selection.  Alpha-to-Enter: 0.25

Response is z (Full) on 8 predictors, with N = 27


Step              1        2        3        4        5        6       7       8
Constant    -0.3079  -0.5604  -0.7852  -1.0079  -1.2173  -1.4264  -1.624  -1.724

Lead          0.162    0.162    0.162    0.162    0.162    0.162   0.162   0.162
T-Value        2.92     3.21     3.52     3.98     4.65     5.99   10.04   13.93
P-Value       0.007    0.004    0.002    0.001    0.000    0.000   0.000   0.000

Tech                   0.126    0.126    0.126    0.126    0.126   0.126   0.126
T-Value                 2.49     2.74     3.10     3.61     4.66    7.80   10.83
P-Value                0.020    0.012    0.005    0.002    0.000   0.000   0.000

DataInfo                        0.112    0.112    0.112    0.112   0.112   0.112
T-Value                          2.43     2.76     3.22     4.14    6.94    9.64
P-Value                         0.023    0.012    0.004    0.001   0.000   0.000

Res                                      0.111    0.111    0.111   0.111   0.111
T-Value                                   2.73     3.19     4.10    6.88    9.54
P-Value                                  0.012    0.004    0.001   0.000   0.000

Proc                                              0.105    0.105   0.105   0.105
T-Value                                            3.00     3.86    6.47    8.98
P-Value                                           0.007    0.001   0.000   0.000

Know                                                       0.105   0.105   0.105
T-Value                                                     3.86    6.46    8.96
P-Value                                                    0.001   0.000   0.000

Empl                                                               0.099   0.099
T-Value                                                             6.10    8.46
P-Value                                                            0.000   0.000

ValGoals                                                                   0.050
T-Value                                                                     4.31
P-Value                                                                    0.000

S             0.236    0.215    0.196    0.173    0.148    0.115  0.0687  0.0495
R-Sq          25.38    40.72    52.87    64.79    75.34    85.85   95.21   97.64
R-Sq(adj)     22.40    35.78    46.72    58.39    69.46    81.61   93.45   96.60
Mallows C-p   547.2    432.0    341.2    252.1    173.5     95.1    25.6     9.0
```

```
Best Subsets. Response is z (Full)

                                            D           V
                                            a           a
                                            t           l
                                            a           G
                                          T I P K   L E o
                                          e n r n R e m a
                       Mallows            c f o o e a p l
Vars  R-Sq  R-Sq(adj)      C-p         S  h o c w s d l s
   1  25.4       22.4    547.2   0.23635            X
   1  15.3       12.0    624.0   0.25175  X
   2  40.7       35.8    432.0   0.21501  X         X
   2  37.5       32.3    456.4   0.22071    X       X
   3  52.9       46.7    341.2   0.19584  X X       X
   3  52.6       46.5    342.9   0.19631  X       X X
   4  64.8       58.4    252.1   0.17307  X X     X X
   4  63.4       56.8    262.6   0.17642  X X X     X
   5  75.3       69.5    173.5   0.14826  X X X   X X
   5  75.3       69.4    173.7   0.14836  X X   X X X
   6  85.9       81.6     95.1   0.11507  X X X X X X
   6  84.7       80.1    103.9   0.11966  X X X   X X X
   7  95.2       93.4     25.6  0.068665  X X X X X X X
   7  88.3       84.0     78.6   0.10744  X X X X X X   X
   8  97.6       96.6      9.0  0.049487  X X X X X X X X
```

The output provided above confirms our predictive regression model for the full sample. Predictive regression equations (PRE) for all other sample segments are provided in Appendix C.

7.6. Dimensional Influence on Enterprise Readiness

The previous sections provided an examination of Phase 2, Section 3 results of our enterprise readiness study. It illustrated how various sample segments evaluated enterprise readiness profiles and provided some comparative insight.

In this section, we provide a more in-depth examination and analysis of each of the eight readiness dimensions by analyzing Phase 2, Section 1 and 2 data. In doing so, we complement our general results obtained in Sections 7.3-7.5 and provide additional validity to our initial observations

7.4.1. Technology

In Section 1 of Phase 2 we asked participants to rate the importance of Technology Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 31 provides the descriptive statistics for the relative importance of technology readiness. In particular, it shows that the mean response to the question of the relative importance of technology readiness by the full sample was 4.046 out of 5.000, indicating an overall high level of importance. A closer look at the various sample segments provides several other interesting findings:

- A marginally significant difference (p=0.093) was found between respondents from large organizations (Mean Response: 4.196) and respondents from small organizations (Mean Response: 3.887).
- A moderately significant difference (p=0.057) was found between respondents from organizations that have deployed mobile ICT (Mean Response: 4.160) and respondents from organization that did not have deployed mobile ICT (Mean Response: 3.714).

While no statistically significant differences were found, the following observations are noteworthy:

- Industry respondents rated the importance of technology readiness when planning for mobile ICT slightly higher (Mean Response: 4.196) than academic respondents (Mean Response: 3.914).

- An approximately equal level of importance of technology readiness was provided by US (Mean Response: 4.066) and Global Respondents (Mean Response: 4.021).
- Respondents from organizations that have a mobile ICT strategy rated the importance of technology readiness when planning for mobile ICT slightly higher (Mean Response: 4.141) than those respondents from organizations that have no mobile ICT strategy (Mean Response: 3.911)

Table 31. Descriptive Statistics (Technology) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	4.046	3.914	4.196	4.066	4.021	3.887	4.196
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.956	0.904	1.000	1.078	0.785	1.050	0.840
Variance	0.915	0.817	1.001	1.162	0.617	1.102	0.706
Minimum	1	1	1	1	2	1	2
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	4.160	3.714	4.141	3.911
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.887	1.084	0.941	0.973
Variance	0.786	1.175	0.885	0.946
Minimum	1	1	1	1
Maximum	5	5	5	5

Figure 42 graphically depicts the aforementioned mean responses of all sample segments.

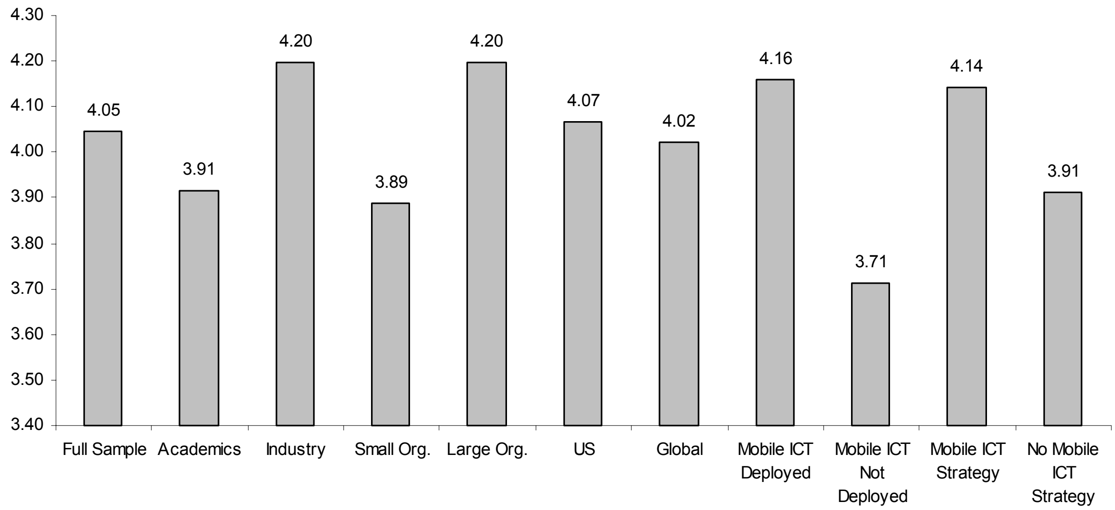


Figure 42. Mean Response, Relative Importance of Technology Readiness

In Section 2 of Phase 2, we explored the technology dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of technology readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Technology Readiness (hardware, software, network, security) tend to …

- T 1. Have a technology infrastructure based on open standards and interfaces.
- T 2. Have a flexible and modular technology infrastructure.
- T 3. Have a technology infrastructure that is adaptable and scalable to changing requirements.
- T 4. Have a highly available, reliable, and secure technology infrastructure.
- T 5. Have a tightly integrated technology infrastructure.
- T 6. Have a technology infrastructure compatible with mobile ICT requirements.
- T 7. Have a mature technology infrastructure.

Table 32 provides the descriptive statistics for the entire expert sample (n=109) for each of the seven technology readiness assessment indicators.

Table 32. Descriptive Statistics (Technology) - Phase 2, Section 2

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	109	109	109	109	109	109	109
Missing	0	0	0	0	0	0	0
Mean	3.670	3.936	4.211	4.037	3.266	3.780	3.330
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.903	0.582	0.695	0.827	0.889	0.832	0.861
Variance	0.816	0.338	0.483	0.684	0.790	0.692	0.742
Minimum	1	2	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

The two highest levels of agreement for the full sample were with the statements that technology-ready organizations tend to have a technology infrastructure that is adaptable and scalable to changing requirements (T3) and one that is highly available, reliable, and secure technology infrastructure (T4). The mean response to each of these statements was 4.211 and 4.037, respectively.

Figure 43 illustrates the mean responses for each of the seven technology readiness assessment indicators for our full sample set. A closer look at the group comparisons depicted in Figure 44 (a-e) reveals several additional insights:

- Industry experts mean level of agreement with all technology readiness assessment indicators (T1 – T7) tend to be higher than the mean level of agreement of academic respondents (see Figure 44 a)

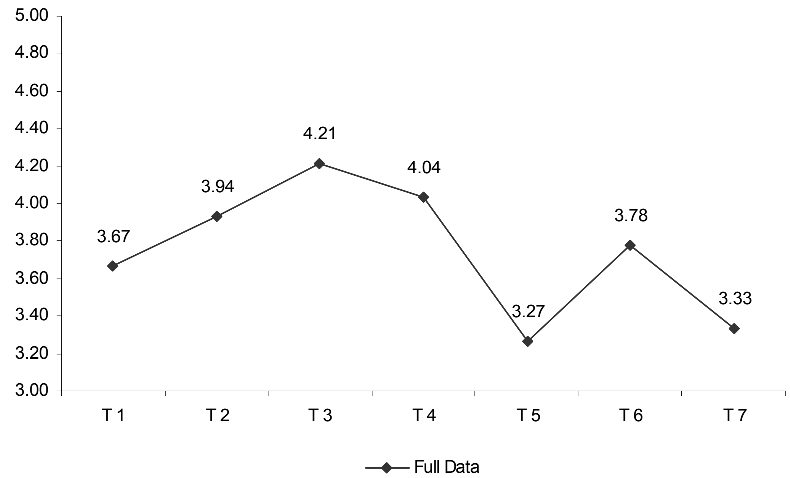
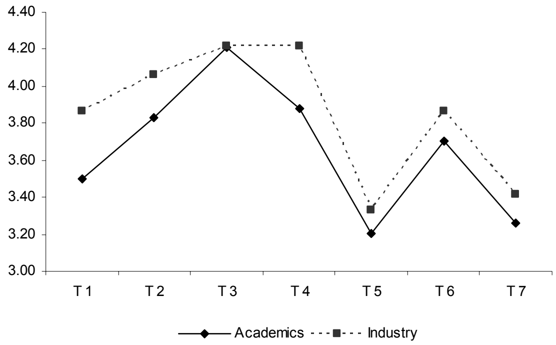


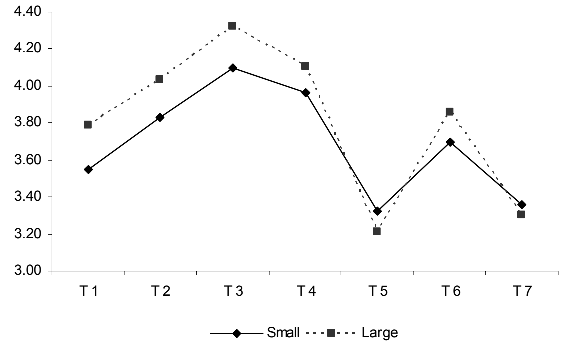
Figure 43. Mean Response (Full Sample), Technology Assessment Indicators

- The same observation applies to the comparison between US and Global respondents. US respondents tend to rate each technology readiness assessment indicator slightly higher than international respondents (see Figure 44 c)
- Industry experts' mean level of agreement with technology-ready organizations having a technology infrastructure based on open standards and interfaces (T1) differed significantly from academic respondents (p=0.037).
- Similarly, US-based respondents' mean level of agreement with technology-ready organizations having a technology infrastructure based on open standards and interfaces (T1) differed significantly from global respondents (p=0.003).
- Also, the mean level of agreement of respondents that have mobile ICT deployed with technology-ready organizations having a technology infrastructure based on open standards and interfaces (T1) differed weakly significantly from respondents of organizations that did not have mobile ICT deployed (p=0.09).

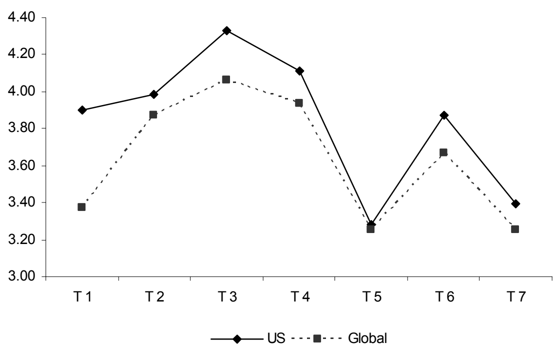
- Industry experts' mean level of agreement with technology-ready organizations having a flexible and modular technology infrastructure (T2) differed significantly (p=0.035) from academic respondents.
- Similarly, the mean level of agreement of respondents that have mobile ICT deployed with technology-ready organizations having a flexible and modular technology infrastructure (T2) differed weakly significantly from respondents of organizations that did not have mobile ICT deployed (p=0.074).
- The mean level of agreement of respondents that have a mobile ICT strategy with technology-ready organizations having a flexible and modular technology infrastructure (T2) differed significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.019).
- US-based respondents' mean level of agreement with technology-ready organizations having a technology infrastructure that is adaptable and scalable to changing requirements (T3) differed moderate significantly from global respondents (p=0.053).
- Industry experts' mean level of agreement with technology-ready organizations having a highly available, reliable, and secure technology infrastructure (T4) differed significantly (p=0.034) from academic respondents.



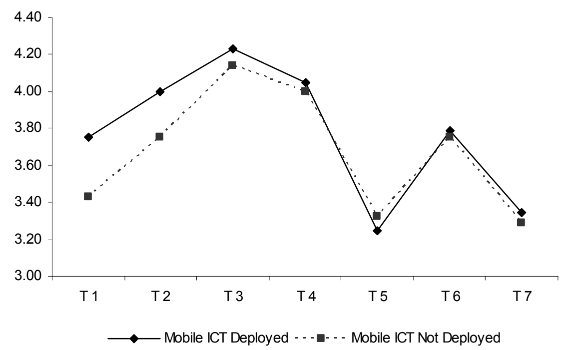
(a) Academics vs. Industry



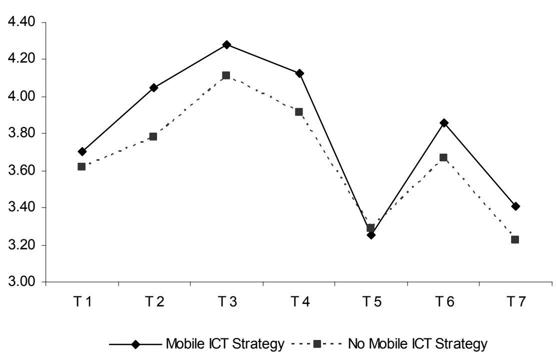
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 44. Mean Group Responses, Technology Assessment Indicators

Note: Descriptive statistics can be found in Appendix C.

In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of technology readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (16%). Figure 45 illustrates the contribution level of technology by all sample segments; it shows that the contribution of technology readiness on enterprise readiness ranges from 12% to 22%.

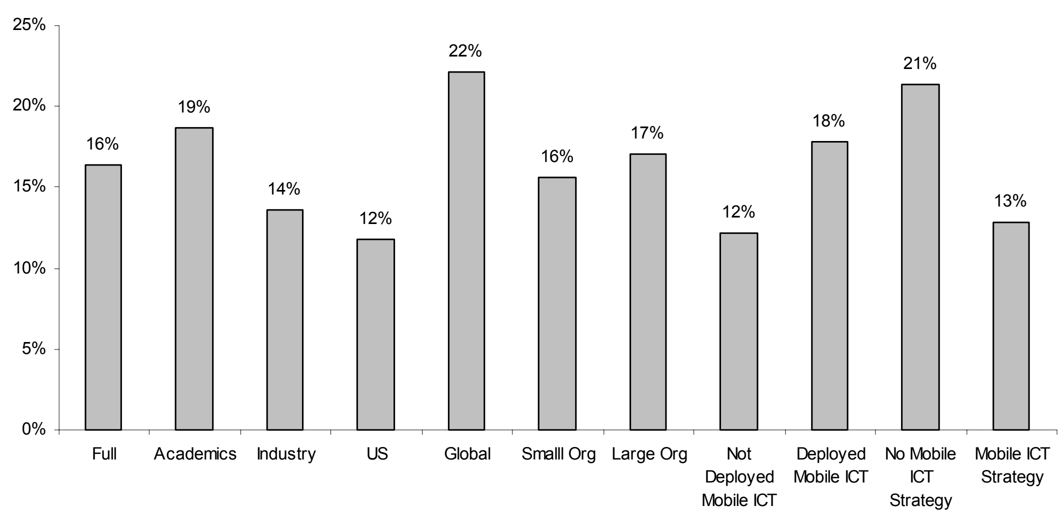


Figure 45. Contribution of Technology Readiness on Enterprise Readiness

While our initial analysis revealed that the contribution of technology readiness on enterprise readiness is 16%, global respondents (22%) and respondents from organizations that did not have a mobile ICT strategy (21%) tended to rate the contribution of technology readiness relatively higher. There was also noticeable difference in the evaluation between academics (19%) and industry (14%) respondents. Academic respondents tend to rate technology readiness higher than industry experts, which can be attributed to the more conceptually-oriented approach of academics.

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 46). We can observe that there is some dispersion of the data points, indicating that respondents evaluated technology in the readiness profiles moderately different than in Section 1.

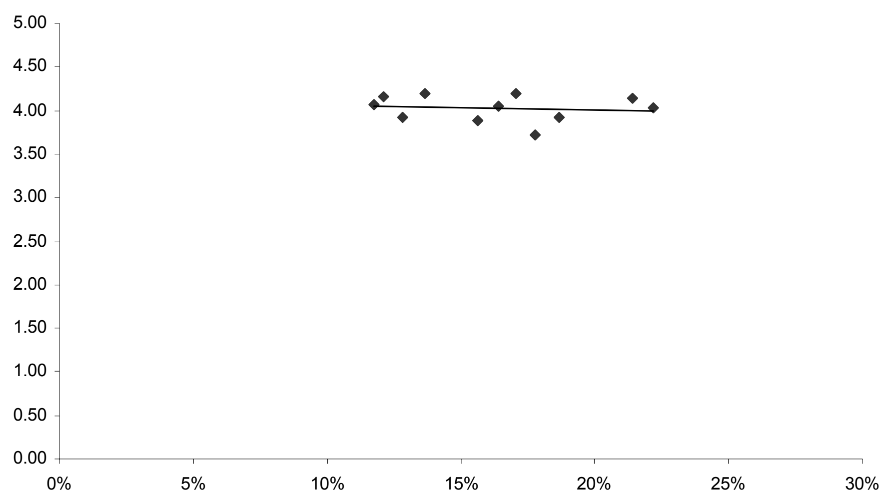


Figure 46. Technology Readiness – Comparison of Phase 2, Section 1 and 3

7.4.2. Data & Information

In Section 1 of Phase 2 we asked participants to rate the importance of Data & Information Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 33 provides the descriptive statistics for the relative importance of data & information readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.936 out of 5.000, indicating an overall high level of importance. A closer look at the various sample segments provides one interesting finding:

- A significant difference (p=0.046) was found between respondents from organizations that have deployed mobile ICT (Mean Response: 4.214) and respondents from organizations that did not (Mean Response: 3.840).

Table 33. Descriptive Statistics (Data & Information) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.936	3.879	4.000	3.951	3.917	3.943	3.929
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.853	0.796	0.917	0.902	0.794	0.949	0.759
Variance	0.727	0.634	0.840	0.814	0.631	0.901	0.577
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.840	4.214	3.922	3.956
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.843	0.833	0.878	0.824
Variance	0.711	0.693	0.772	0.680
Minimum	2	2	2	2
Maximum	5	5	5	5

While no statistically significant differences were found, the following observations are noteworthy:

- Industry respondents rated the importance of data & information readiness when planning for mobile ICT slightly higher (Mean Response: 4.000) than academic respondents (Mean Response: 3.879).

Figure 47 graphically depicts the aforementioned mean responses of all sample segments.

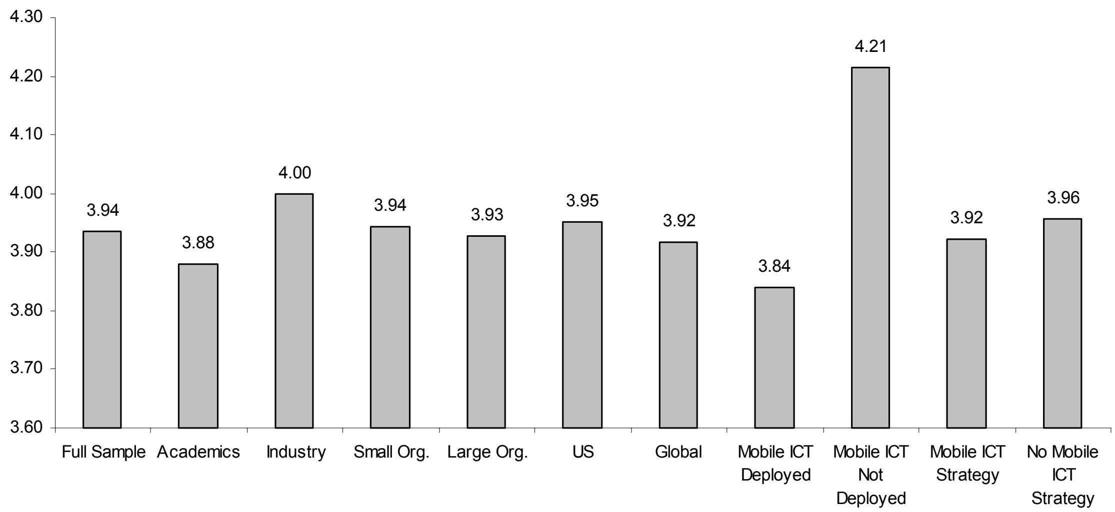


Figure 47. Mean Response, Relative Importance of Data & Information Readiness

In Section 2 of Phase 2, we explored the data and information dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of data and information readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Data and Information Readiness tend to …

D&I 1. Have an integrated, consistent, and transparent view of enterprise data.
D&I 2. Have put controls and policies in place to protect, secure, and recover enterprise data.

D&I 3. Have established mature standards and policies for enterprise data.
D&I 4. Ensure that required data and information is available in a timely and effective manner.
D&I 5. Have the ability to synchronize enterprise data effectively in both connected and disconnected environments.

Table 34 provides the descriptive statistics for the entire expert sample (n=109) for each of the five data and information readiness assessment indicators.

Table 34. Descriptive Statistics (Data & Information) - Phase 2, Section 2

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	109	109	109	109	109
Missing	0	0	0	0	0
Mean	3.936	4.110	3.826	3.972	3.872
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.808	0.832	0.743	0.713	0.783
Variance	0.653	0.691	0.553	0.508	0.613
Minimum	1	1	2	2	2
Maximum	5	5	5	5	5

The highest level of agreement for the full sample were with the statement that data and information-ready organizations tend to have put controls and policies in place to protect, secure, and recover enterprise data (D&I 2) followed by organizations that ensure that required data and information is available in a timely and effective manner (D&I 4), and organizations that have an integrated, consistent, and transparent view of enterprise data (D&I 1). Figure 48 illustrates the mean responses for each the five data and information readiness assessment indicators for our full sample set.

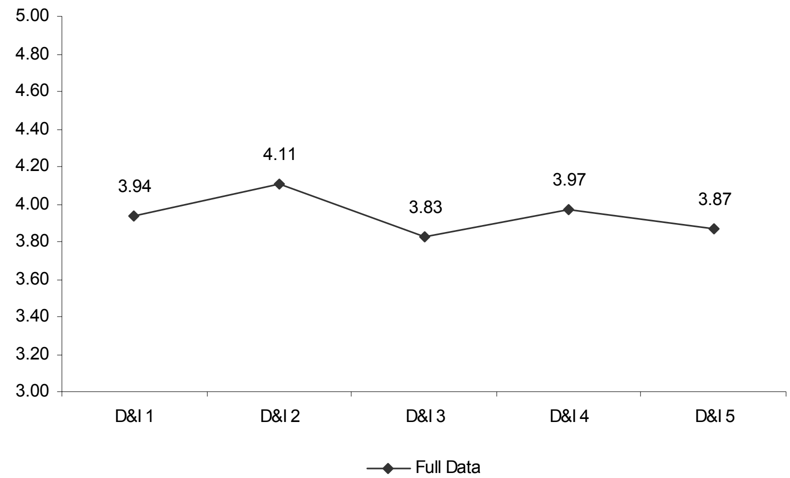
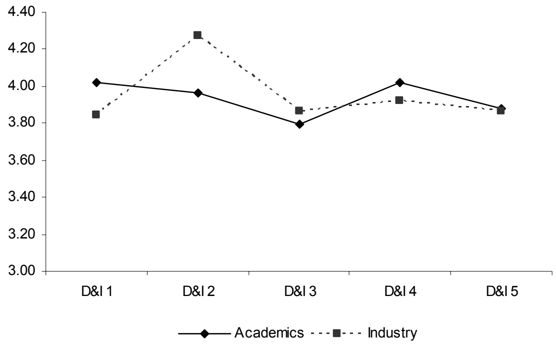


Figure 48. Mean Response (Full Sample), Data & Info Assessment Indicators

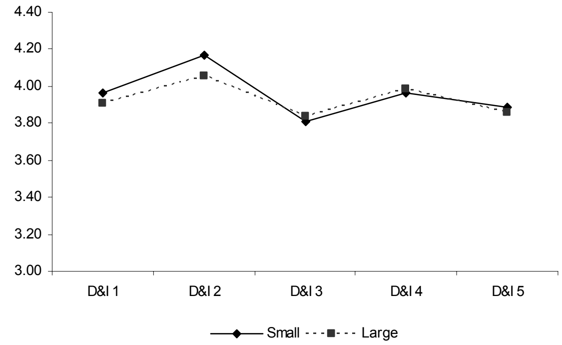
A closer look at the group comparisons depicted in Figure 49 (a-e) reveals two additional insights:

- Industry experts' mean level of agreement with data and information-ready organizations having put controls and policies in place to protect, secure, and recover enterprise data (D&I 2) differed significantly from academic respondents (p=0.037).

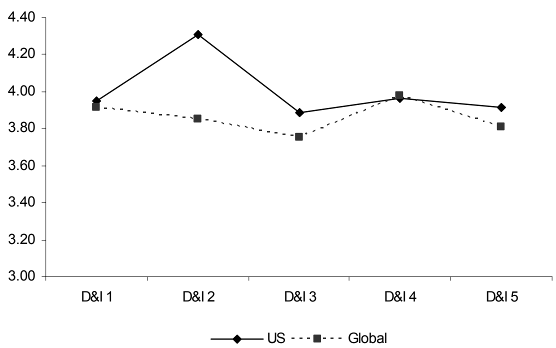
- The same observation applies to the comparison between US and Global respondents. US-based respondents' mean level of agreement with data and information-ready organizations having put controls and policies in place to protect, secure, and recover enterprise data (D&I 2) differed significantly from global respondents (p=0.003).



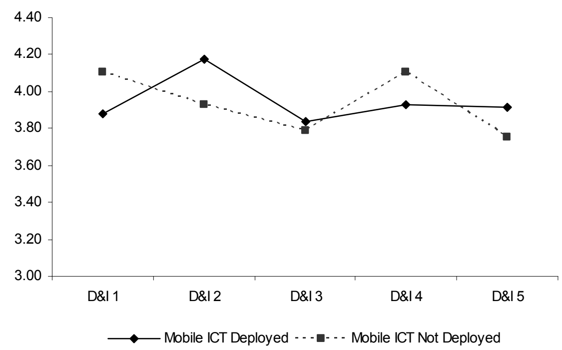
(a) Academics vs. Industry



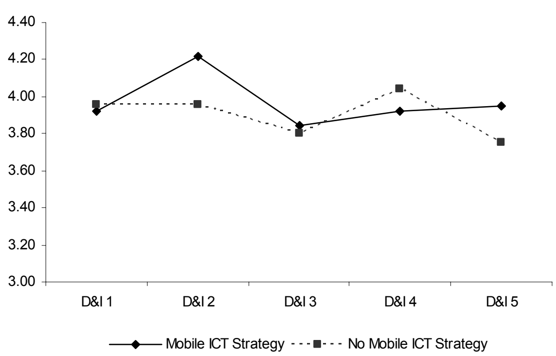
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 49. Mean Group Responses, Data & Info Assessment Indicators

Note: Descriptive statistics can be found in Appendix C.

In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of data and information readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (13%). Figure 50 illustrates the contribution level of data and information by all sample segments; it shows that the contribution of data and information readiness on enterprise readiness ranges from 10% to 16%.

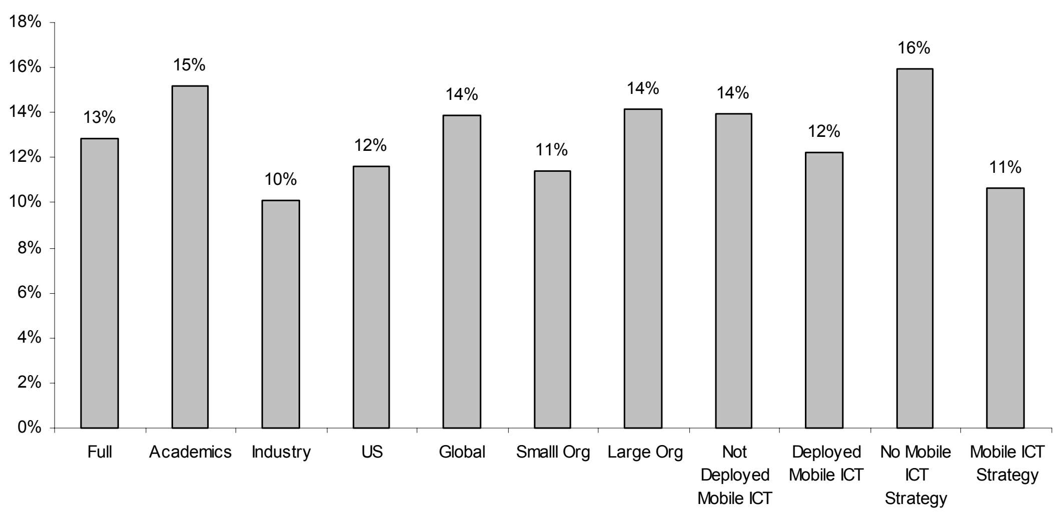


Figure 50. Contribution of Data & Information Readiness on Enterprise Readiness

While our initial analysis revealed that the contribution of data and information readiness on enterprise readiness is 13%, academics (15%), global respondents (14%) and respondents from organizations that did not have a mobile ICT deployed (14%) or a mobile ICT strategy (16%) tended to rate the contribution of technology readiness moderately higher. There was also noticeable difference in the evaluation between academics (15%) and industry (10%) respondents. Academic respondents tend to rate data and information readiness higher than industry experts, which may be attributed to the more conceptual orientation of academics.

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 51). We can observe that there is some dispersion of the data points, indicating that respondents evaluated technology in the readiness profiles moderately different than in Section 1.

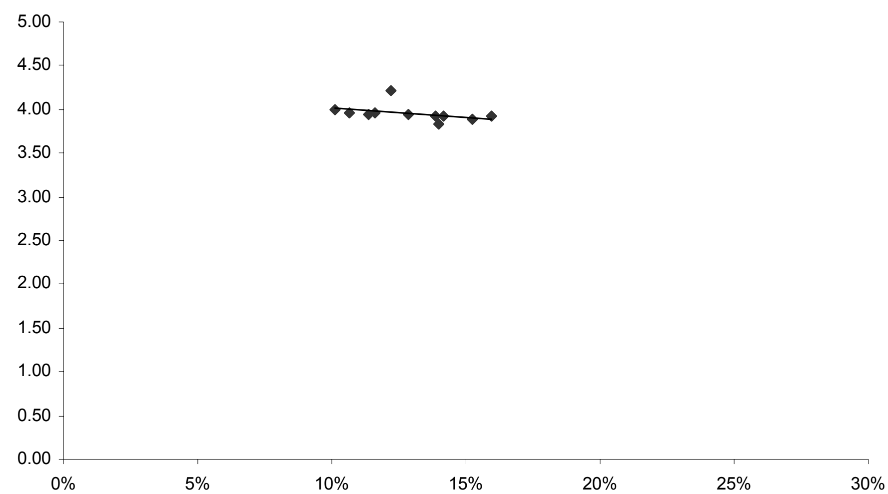


Figure 51. Data & Information Readiness – Comparison of Phase 2, Section 1 and 3

7.4.3. Process

In Section 1 of Phase 2 we asked participants to rate the importance of Process Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 35 provides the descriptive statistics for the relative importance of process readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.835 out of 5.000, indicating an overall moderate level of importance. A closer look at the various sample segments indicates no significant differences in mean responses.

Table 35. Descriptive Statistics (Process) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.835	3.862	3.804	3.787	3.896	3.868	3.804
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.877	0.868	0.895	0.933	0.805	0.900	0.862
Variance	0.769	0.753	0.801	0.870	0.648	0.809	0.743
Minimum	1	1	2	1	2	1	2
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.840	3.821	3.828	3.844
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.928	0.723	0.952	0.767
Variance	0.861	0.522	0.906	0.589
Minimum	1	2	1	2
Maximum	5	5	5	5

Figure 52 graphically depicts the aforementioned mean responses of all sample segments.

In Section 2 of Phase 2, we explored the process dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of process readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree).

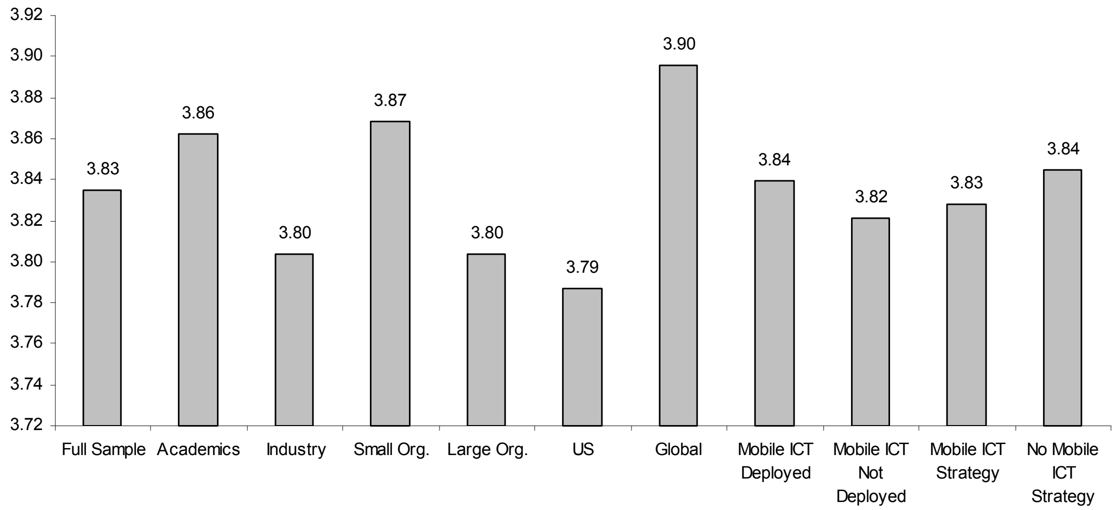


Figure 52. Mean Response, Relative Importance of Process Readiness

For review purposes, recall the following statements:

Organizations that exhibit a high level of Process Readiness tend to …

P 1. Have standardized and mature business processes.
P 2. Have adaptive business processes.
P 3. Have a high degree of net-enabled business processes.
P 4. Have organizational policies and strategies for business processes in place.
P 5. Have formalized governance, decision-making, and resource-related processes in place.
P 6. Have a high quality and extent of documentation.

Table 36. Descriptive Statistics (Process) - Phase 2, Section 2

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	109	109	109	109	109	109
Missing	0	0	0	0	0	0
Mean	3.826	4.009	3.752	3.872	3.716	3.569
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.768	0.726	0.784	0.640	0.746	0.865
Variance	0.590	0.528	0.614	0.409	0.557	0.748
Minimum	2	2	1	2	2	2
Maximum	5	5	5	5	5	5

Table 36 provides the descriptive statistics for the entire expert sample (n=109) for each of the six process readiness assessment indicators.

The highest level of agreement for the full sample was with the statement that process-ready organizations tend to have adaptive business processes (P 2) followed by organizations that have policies and strategies for business processes in place (P 4), and organizations that have standardized and mature business processes (P 1). Figure 53 illustrates the mean responses for each of the six process readiness assessment indicators for our full sample set.

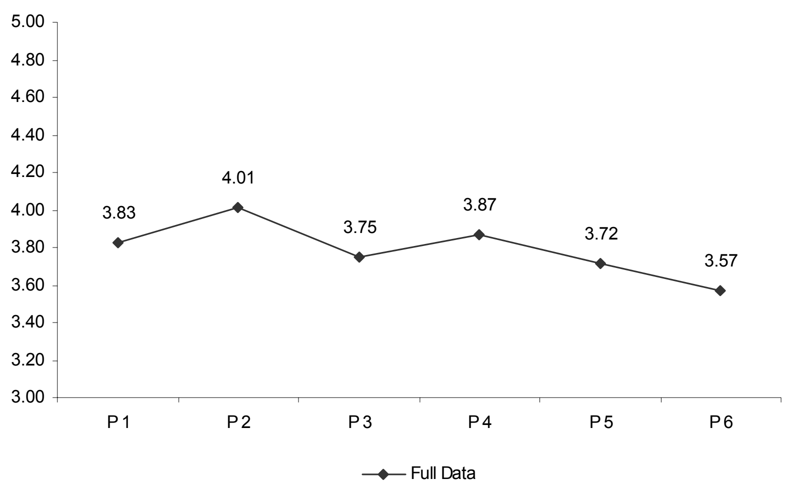


Figure 53. Mean Response (Full Sample), Process Assessment Indicators

A closer look at the group comparisons depicted in Figure 54 (a-e) reveals three additional insights:

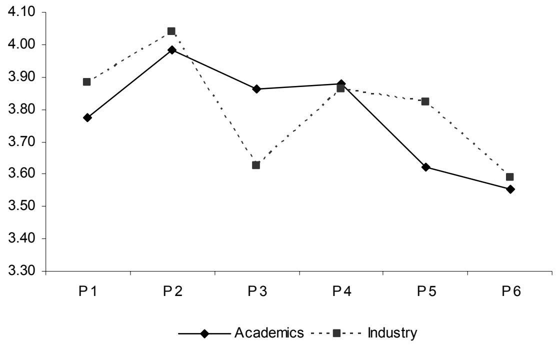
- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that process-ready organizations have adaptive business processes

(P2) differed significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.046).

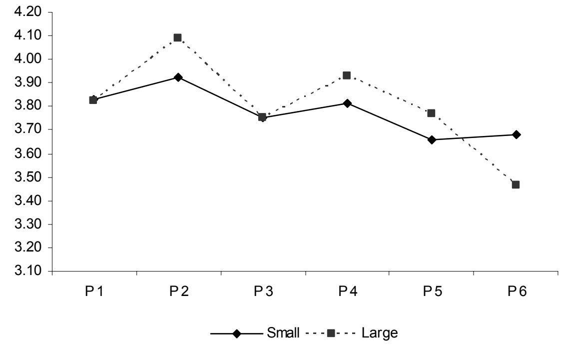
- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that process-ready organizations have formalized governance, decision-making, and resource-related processes in place (P5) differed significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.017).

- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that process-ready organizations have a high quality and extent of documentation (P6) differed moderate significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.077).

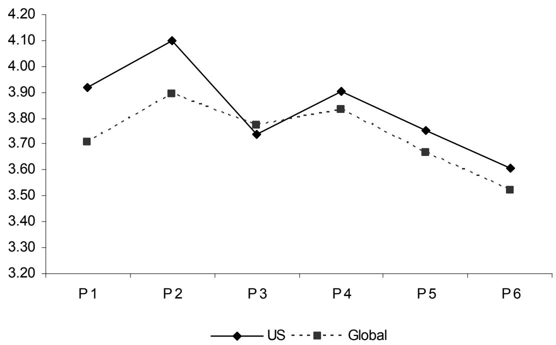
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of process readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (10%). Figure 55 illustrates the contribution level of process by all sample segments; it shows that the contribution of data and information readiness on enterprise readiness ranges from 7% to 13%.



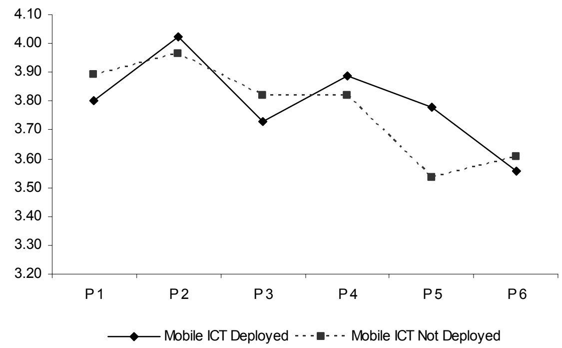
(a) Academics vs. Industry



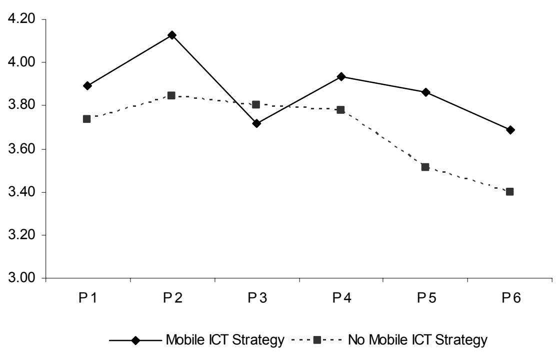
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 54. Mean Group Responses, Process Assessment Indicators

Note: Descriptive statistics can be found in Appendix C.

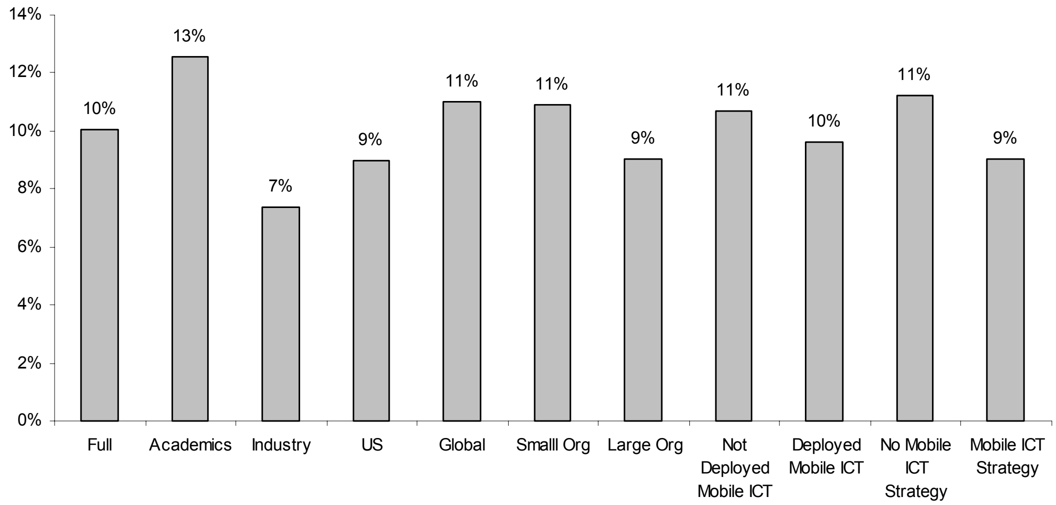


Figure 55. Contribution of Process Readiness on Enterprise Readiness

While our initial analysis revealed that the contribution of process readiness on enterprise readiness is 10%, academics (13%) rated process readiness higher than industry experts, which may be attributed to the more conceptual orientation of academics.

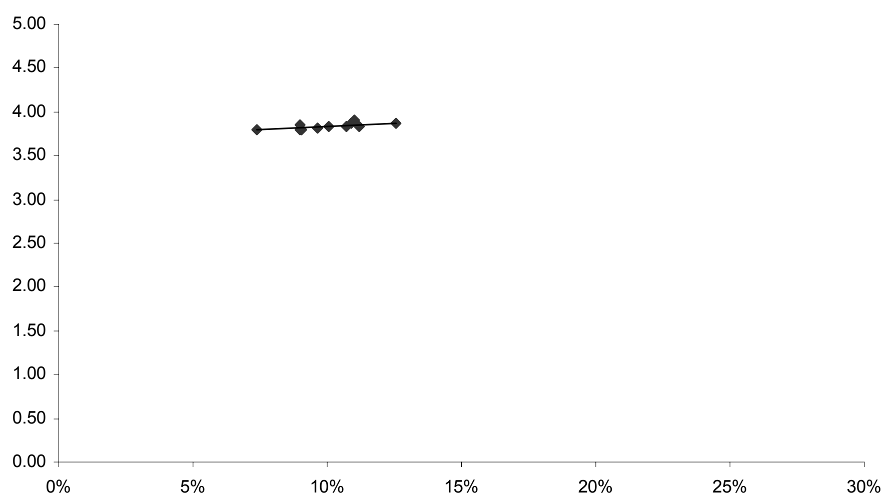


Figure 56. Process Readiness – Comparison of Phase 2, Section 1 and 3

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 56). We can observe that there is some dispersion of the data points, indicating that respondents evaluated the process dimension in the readiness profiles moderately different than in Section 1.

7.3.4. Knowledge

In Section 1 of Phase 2 we asked participants to rate the importance of Knowledge Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 37 provides the descriptive statistics for the relative importance of knowledge readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.569 out of 5.000, indicating an overall moderate level of importance. A closer look at the various sample segments indicates no significant differences in mean responses.

Table 37. Descriptive Statistics (Knowledge) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.569	3.552	3.588	3.525	3.625	3.566	3.571
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.875	0.776	0.983	0.942	0.789	0.910	0.850
Variance	0.766	0.603	0.967	0.887	0.622	0.827	0.722
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.568	3.571	3.594	3.533
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.851	0.959	0.904	0.842
Variance	0.723	0.921	0.816	0.709
Minimum	2	2	2	2
Maximum	5	5	5	5

Figure 57 graphically depicts the aforementioned mean responses of all sample segments.

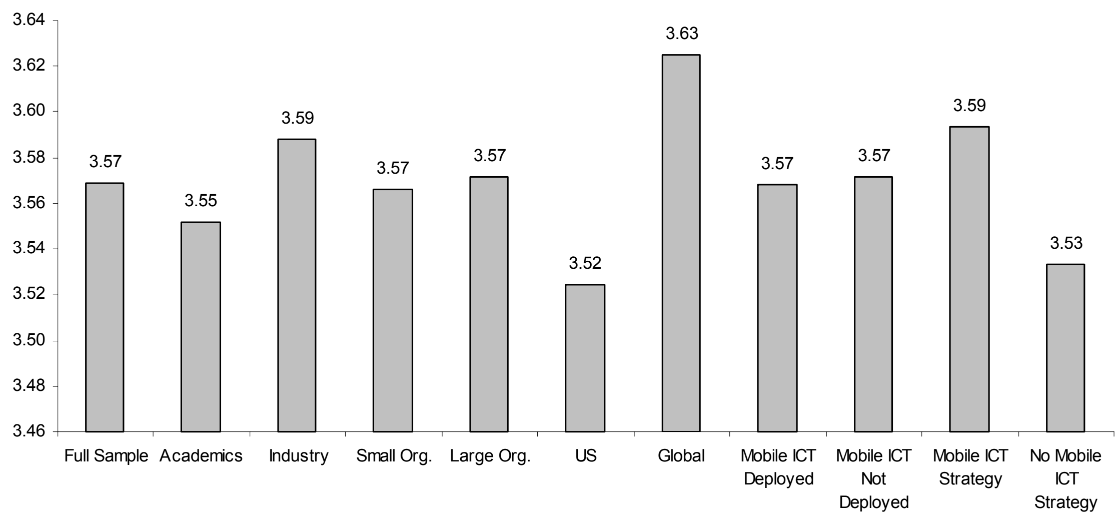


Figure 57. Mean Response, Relative Importance of Knowledge Readiness

In Section 2 of Phase 2, we explored the knowledge dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of knowledge readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Knowledge Readiness tend to …

K 1. Have an understanding of organizational ICT needs.
K 2. Have an understanding of regulatory requirements.
K 3. Be aware of the value and impact of ICT on the organization.
K 4. Be aware of ICT use by other organizations.
K 5. Have previous experience with ICT implementations.
K 6. Be aware of the capabilities provided by ICT.
K 7. Have a formalized knowledge management system in place.
K 8. Encourage continuing education and knowledge advancement by its members.
K 9. Have ICT diffused throughout the entire organization.

Table 38 provides the descriptive statistics for the entire expert sample (n=109) for each of the nine knowledge readiness assessment indicators.

Table 38. Descriptive Statistics (Knowledge) - Phase 2, Section 2

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	109	109	109	109	109	109	109	109	109
Missing	0	0	0	0	0	0	0	0	0
Mean	4.092	3.789	4.147	3.734	3.670	4.138	3.257	3.890	3.606
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.752	0.783	0.678	0.753	0.850	0.585	0.876	0.750	0.861
Variance	0.566	0.612	0.460	0.567	0.723	0.342	0.767	0.562	0.741
Minimum	1	2	2	2	1	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

The three highest levels of agreement for the full sample were with the statements that knowledge-ready organizations tend to be aware of the value and impact of ICT on the organization (K3, Mean Response: 4.147), be aware of the capabilities provided by ICT (K6, Mean Response: 4.138), and have an understanding of organizational ICT needs

(K1, Mean Response: 4.092). Figure 58 illustrates the mean responses for each of the seven technology readiness assessment indicators for our full sample set.

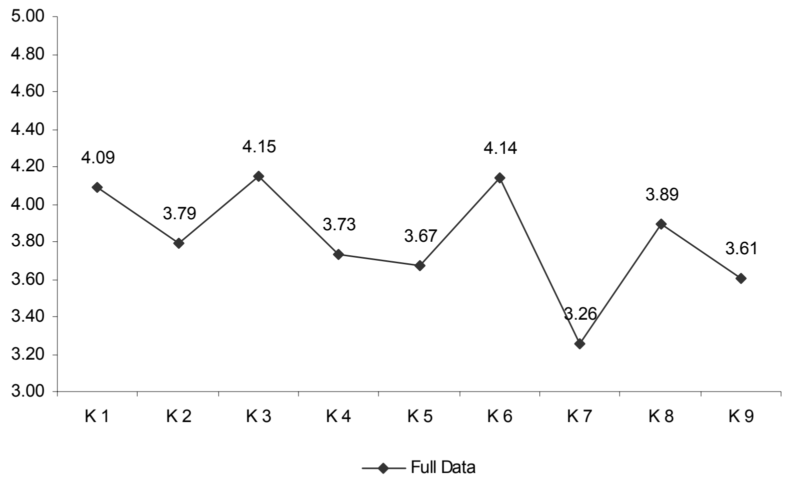


Figure 58. Mean Response (Full Sample), Knowledge Assessment Indicators

A closer look at the group comparisons depicted in Figure 59 (a-e) reveals several additional insights:

- The mean level of agreement of respondents from large organizations with the statement that knowledge-ready organizations encourage continuing education and knowledge advancement by its members (K8) differed significantly from respondents of small organizations (p=0.018).

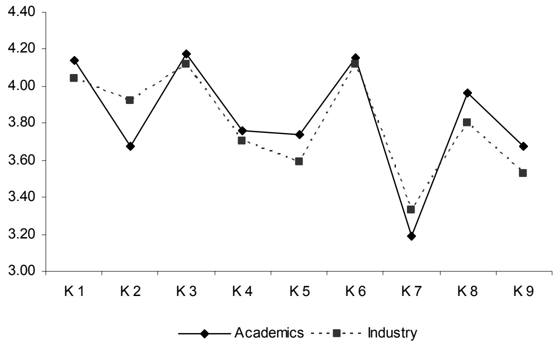
- US-based respondents' mean level of agreement with the statement that knowledge-ready organizations have a formalized knowledge management system in place (K7) differed moderate significantly from global respondents (p=0.077).

- The mean level of agreement of respondents that have mobile ICT deployed with the statement that knowledge-ready organizations have an understanding of regulatory requirements (K2) differed significantly from respondents of organizations that did not have mobile ICT deployed (p=0.001).

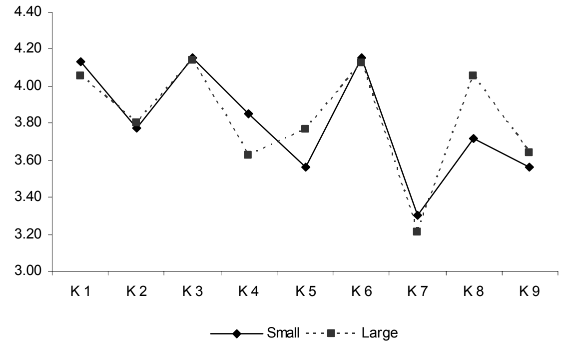
- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that knowledge-ready organizations have an understanding of regulatory requirements (K2) differed significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.001).

- The mean level of agreement of respondents that have mobile ICT deployed with the statement that knowledge-ready organizations Have previous experience with ICT implementations (K5) differed moderate significantly from respondents of organizations that did not have mobile ICT deployed (p=0.073).

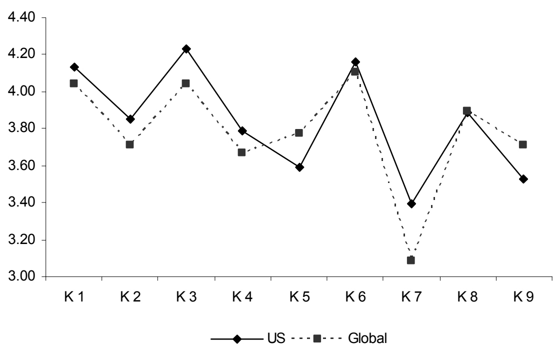
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of knowledge readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (10%). Figure 60 illustrates the contribution level of process by all sample segments; it shows that the contribution of data and information readiness on enterprise readiness ranges from 7% to 13%.



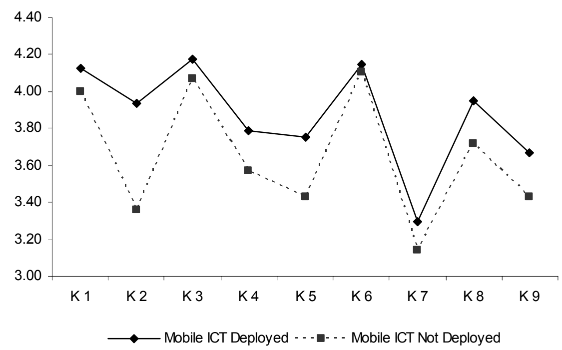
(a) Academics vs. Industry



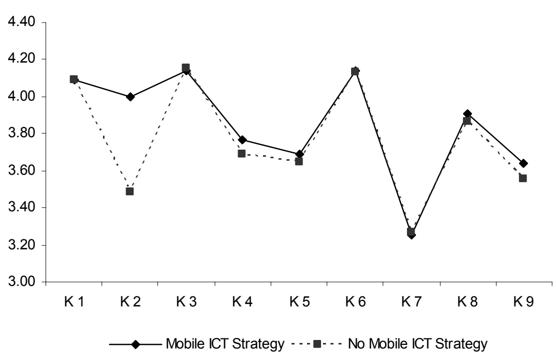
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 59. Mean Group Responses, Knowledge Assessment Indicators

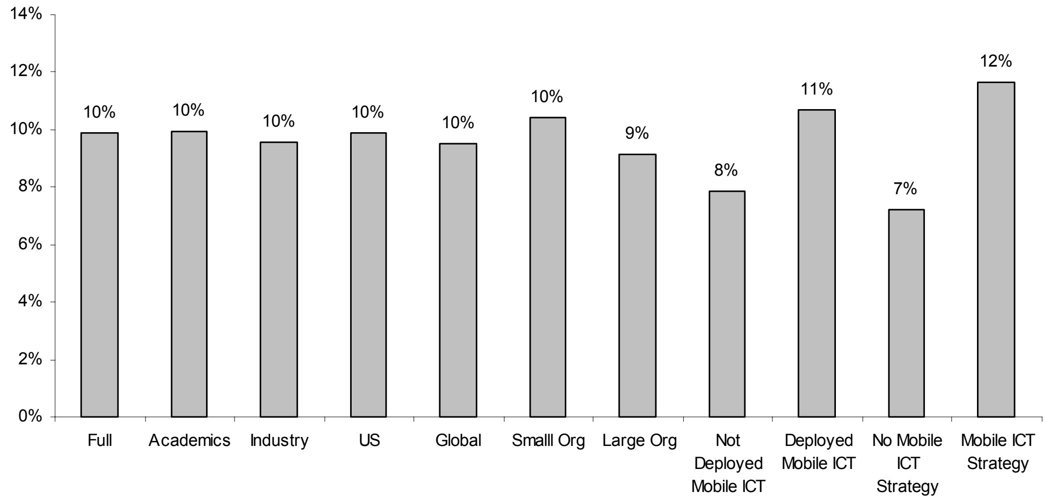


Figure 60. Contribution of Knowledge Readiness on Enterprise Readiness

While our initial analysis revealed that the contribution of process readiness on enterprise readiness is 10%, we can clearly see from Figure 60 that almost all sample segments rate knowledge readiness around 10%. However, there is a difference between respondents from organizations with a mobile ICT strategy and those without. Respondents from the former group (12%) rated knowledge readiness higher than those from the latter group.

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 61). We can observe that there is some dispersion of the data points, indicating that respondents evaluated knowledge in the readiness profiles moderately different than in Section 1.

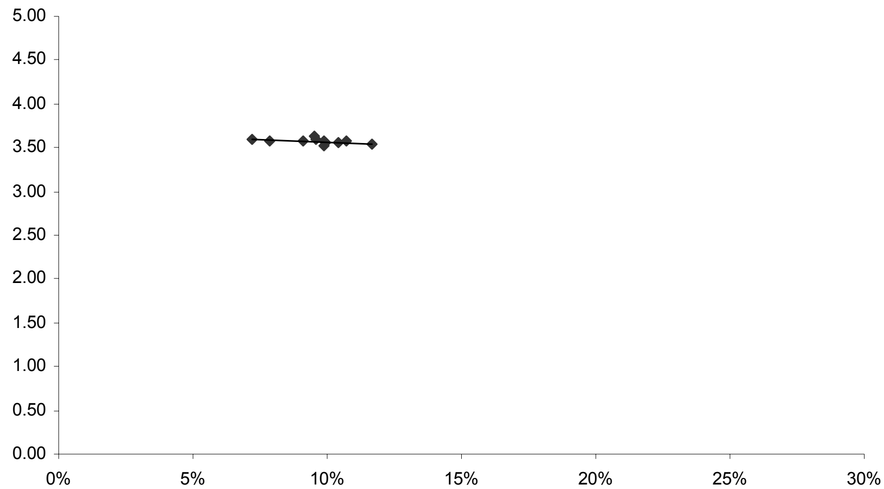


Figure 61. Knowledge Readiness – Comparison of Phase 2, Section 1 and 3

7.4.5. Resource

In Section 1 of Phase 2 we asked participants to rate the importance of Resource Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 39 provides the descriptive statistics for the relative importance of resource readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.899 out of 5.000, indicating an overall high level of importance.

An examination at the various sample segments indicates no significant differences in mean responses.

Table 39. Descriptive Statistics (Resource) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.899	3.897	3.902	3.967	3.813	3.943	3.857
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.912	0.931	0.900	0.816	1.024	0.908	0.923
Variance	0.832	0.866	0.810	0.666	1.049	0.824	0.852
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.926	3.821	4.000	3.756
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.919	0.905	0.926	0.883
Variance	0.844	0.819	0.857	0.780
Minimum	2	2	2	2
Maximum	5	5	5	5

Figure 62 graphically depicts the aforementioned mean responses of all sample segments.

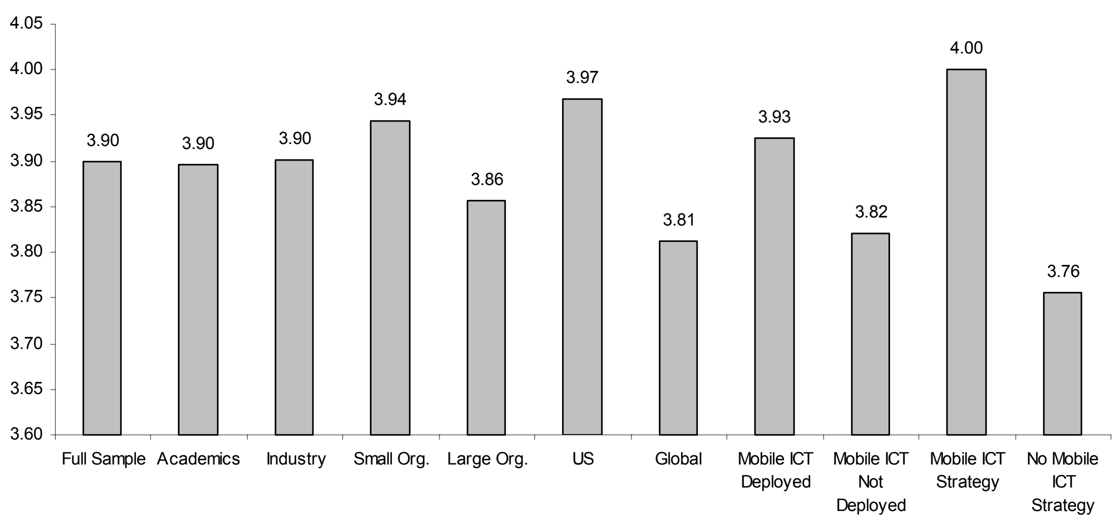


Figure 62. Mean Response, Relative Importance of Resource Readiness

In Section 2 of Phase 2, we explored the resource dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of resource readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Resource Readiness tend to …

R 1. Provide sufficient financial support for ICT implementation.
R 2. Have an IT staff capable of managing the adoption and implementation of ICT.
R 3. Have sufficient number of ICT experts in the organization.
R 4. Have sufficient consultant expertise readily available.
R 5. Receive sufficient vendor support.
R 6. Have ICT innovation champions in the organization.
R 7. Make extensive and high quality training resources available to its members.

Table 40 provides the descriptive statistics for the entire expert sample (n=109) for each of the seven resource readiness assessment indicators.

Table 40. Descriptive Statistics (Resources) - Phase 2, Section 2

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	109	109	109	109	109	109	109
Missing	0	0	0	0	0	0	0
Mean	4.110	4.128	3.679	3.596	3.835	4.092	3.697
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.762	0.795	0.744	0.783	0.687	0.928	0.811
Variance	0.580	0.631	0.553	0.613	0.472	0.862	0.657
Minimum	1	1	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

The three highest levels of agreement for the full sample were with the statements that resource-ready organizations tend to have an IT staff capable of managing the adoption and implementation of ICT (R2, Mean Response: 4.128), provide sufficient financial support for ICT implementation (R1, Mean Response: 4.110), and have ICT innovation champions in the organization (R6, Mean Response: 4.092). Figure 63 illustrates the mean responses for each of the seven technology readiness assessment indicators for our full sample set.

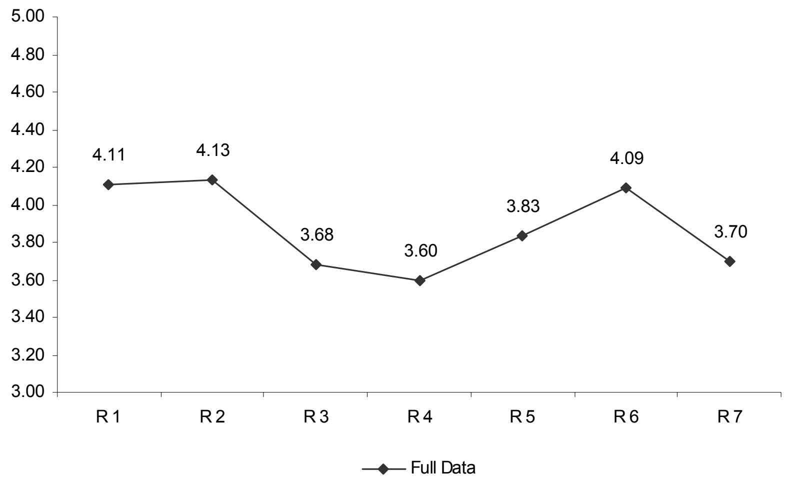


Figure 63. Mean Response (Full Sample), Resource Assessment Indicators

A closer look at the group comparisons depicted in Figure 64 (a-e) reveals two additional insights:

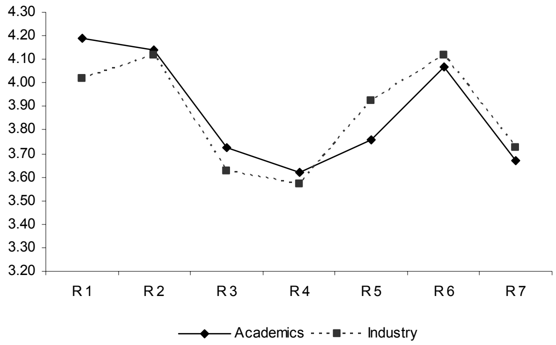
- The mean level of agreement of respondents from large organizations with the statement that resource-ready organizations have sufficient number of ICT experts in the organization (R3) differed moderate significantly from respondents of small organizations (p=0.071).

- US-based respondents' mean level of agreement with the statement that resource-ready organizations have ICT innovation champions in the organization (R6) differed significantly from global respondents (p=0.013).

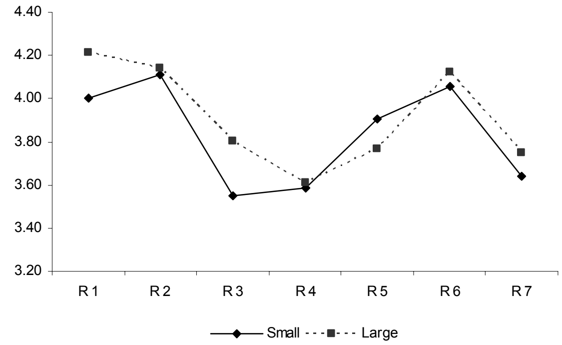
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of resource readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (12%). Figure 65 illustrates the contribution level of the resource dimension by all sample segments; it shows that the contribution of data and information readiness on enterprise readiness ranges from 8% to 16%.

While our initial analysis revealed that the contribution of process readiness on enterprise readiness is 12%, respondents from large organizations (16%) rated resource readiness much higher than respondents from smaller organizations.

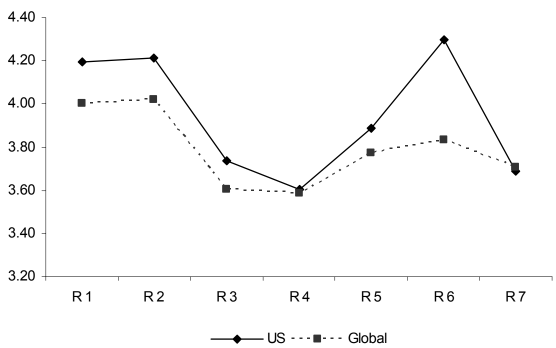
In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 66). We can observe that there is some dispersion of the data points, indicating that respondents evaluated resource in the readiness profiles moderately different than in Section 1.



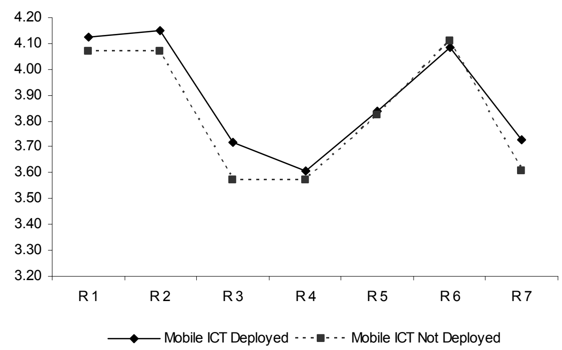
(a) Academics vs. Industry



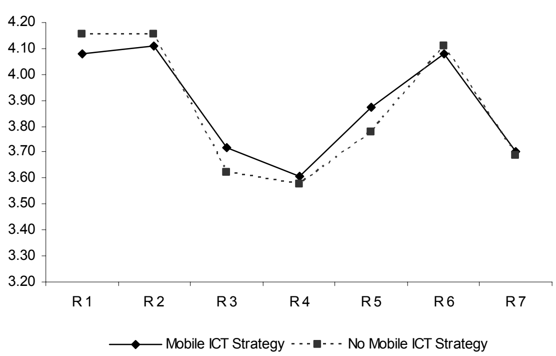
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 64. Mean Group Responses, Resource Assessment Indicators

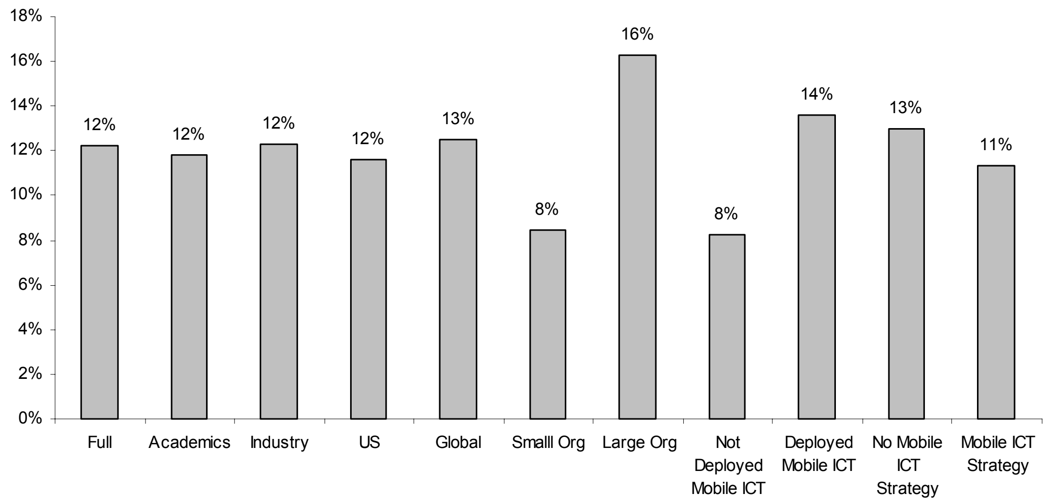


Figure 65. Contribution of Resource Readiness on Enterprise Readiness

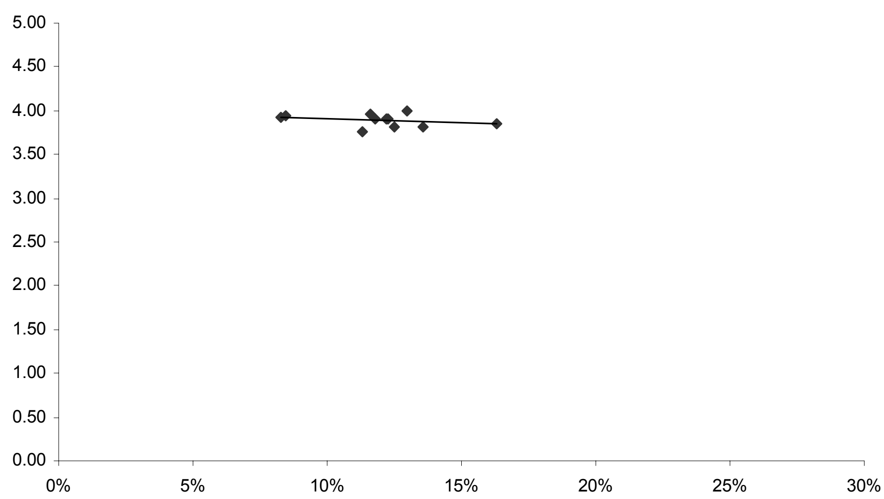


Figure 66. Resource Readiness – Comparison of Phase 2, Section 1 and 3

7.5.6. Leadership

In Section 1 of Phase 2 we asked participants to rate the importance of Leadership Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 41 provides the descriptive statistics for the relative importance of leadership readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.899 out of 5.000, indicating an overall high level of importance.

An examination at the various sample segments indicates no significant differences in mean responses.

Table 41. Descriptive Statistics (Leadership) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.899	3.845	3.961	4.082	3.667	3.943	3.857
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.999	1.005	0.999	0.918	1.059	0.864	1.119
Variance	0.999	1.011	0.998	0.843	1.121	0.747	1.252
Minimum	1	1	1	2	1	2	1
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.877	3.964	3.938	3.844
Median	4.000	4.000	4.000	4.000
Std. Deviation	1.017	0.962	0.941	1.086
Variance	1.035	0.925	0.885	1.180
Minimum	1	2	1	1
Maximum	5	5	5	5

Figure 67 graphically depicts the aforementioned mean responses of all sample segments.

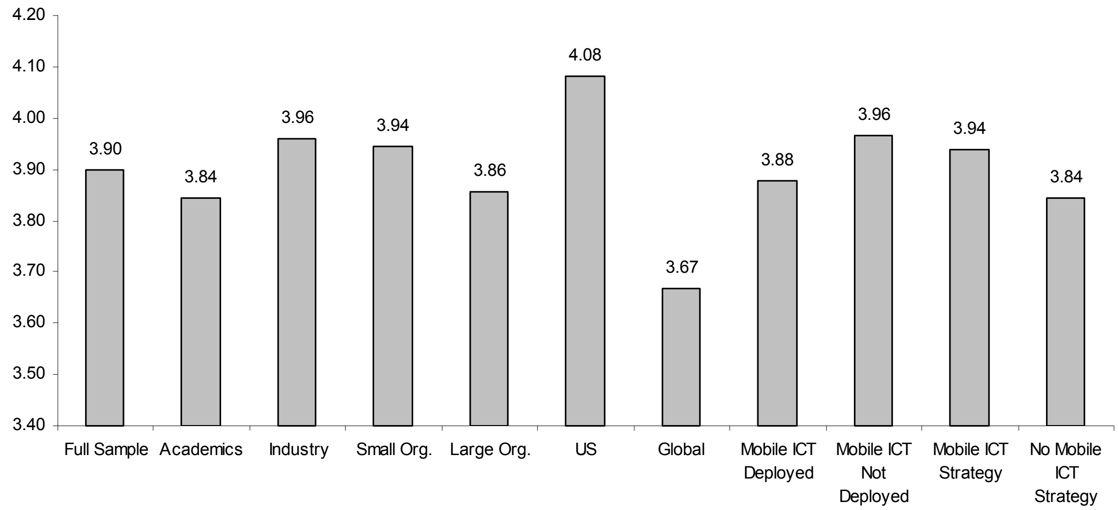


Figure 67. Mean Response, Relative Importance of Leadership Readiness

In Section 2 of Phase 2, we explored the leadership dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of leadership readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Leadership Readiness tend to …

L 1. Have executives with the ability to clearly articulate the strategic vision of the firm.
L 2. Have executives with the ability to communicate the value and importance of ICT.
L 3. Have executives with the ability to execute the strategic plans and vision of the firm.
L 4. Have executives who have had previous experience with ICT change initiatives.
L 5. Have innovative and risk-oriented executives.
L 6. Have executives who support and commit to ICT innovations.
L 7. Have executives with the competency to lead and manage ICT innovations.
L 8. Have executives who are leadership champions.

Table 42 provides the descriptive statistics for the entire expert sample (n=109) for each of the eight leadership readiness assessment indicators.

Table 42. Descriptive Statistics (Leadership) Phase 2, Section 2

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	109	109	109	109	109	109	109	109
Missing	0	0	0	0	0	0	0	0
Mean	4.239	4.147	4.303	3.560	3.697	4.248	3.881	3.899
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.792	0.768	0.727	0.821	0.855	0.655	0.790	0.769
Variance	0.628	0.589	0.528	0.675	0.732	0.429	0.625	0.592
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

The four highest levels of agreement for the full sample were with the statements that leadership-ready organizations tend to have executives with the ability to execute the strategic plans and vision of the firm (L3, Mean Response: 4.303), who support and commit to ICT innovations (L6, Mean Response: 4.248), with the ability to clearly articulate the strategic vision of the firm (L1, Mean Response: 4.239), and with the ability to communicate the value and importance of ICT (L2, Mean Response: 4.147). Figure 68 illustrates the mean responses for each of the eight leadership readiness assessment indicators for our full sample set.

A closer look at the group comparisons depicted in Figure 69 (a-e) reveals several additional insights:

- Industry experts mean level of agreement with all leadership readiness assessment indicators (L1 – L8) tend to be higher than the mean level of agreement of academic respondents

- US-based respondents' mean level of agreement with the statement that leadership-ready organizations have innovative and risk-oriented executives (L5) differed moderate significantly from global respondents (p=0.099).

- The mean level of agreement of respondents that have mobile ICT deployed with the statement that leadership-ready organizations have executives with the ability to clearly articulate the strategic vision of the firm (L1) differed significantly from respondents of organizations that did not have mobile ICT deployed (p=0.054).

- The mean level of agreement of respondents that have mobile ICT deployed with the statement that leadership-ready organizations have executives who have had previous experience with ICT change initiatives (L4) differed significantly from respondents of organizations that did not have mobile ICT deployed (p=0.004).

- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that leadership-ready organizations have executives with the ability to clearly articulate the strategic vision of the firm (L1) differed significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.033).

- The mean level of agreement of respondents that have a mobile ICT strategy with the statement that leadership-ready organizations have executives who have had previous experience with ICT change initiatives (L4) differed moderate significantly from respondents of organizations that did not have a mobile ICT strategy (p=0.085).

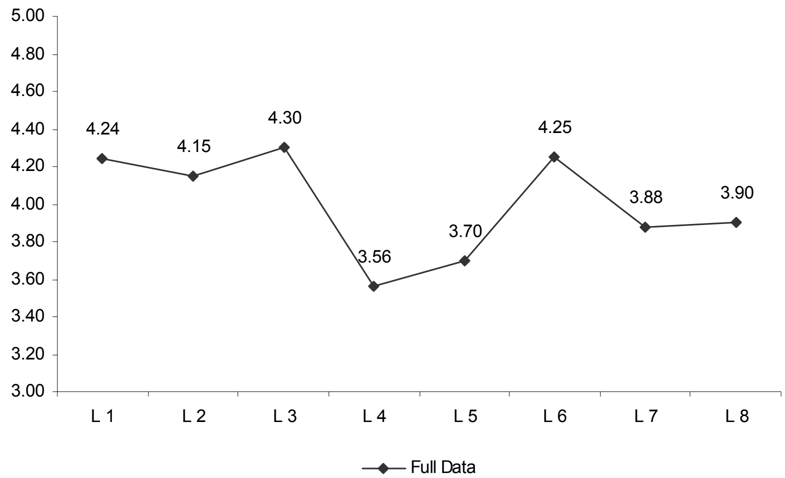
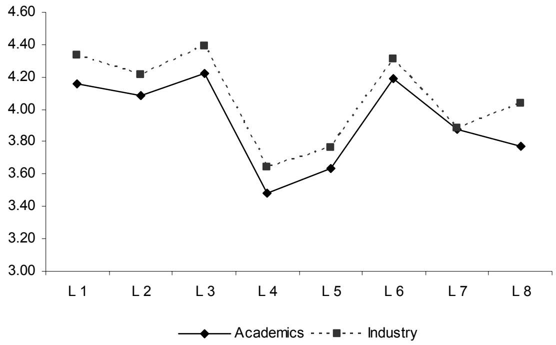
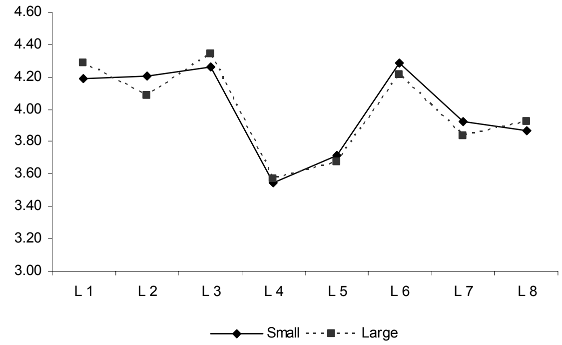


Figure 68. Mean Response (Full Sample), Leadership Assessment Indicators

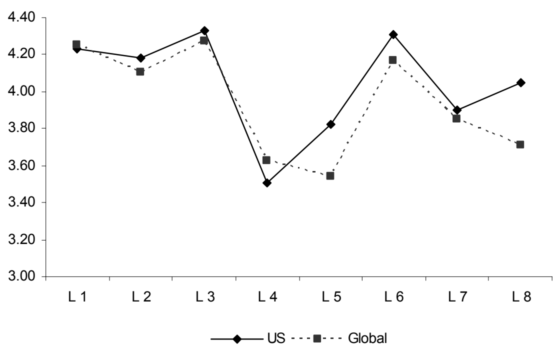
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of leadership readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (27%). Figure 70 illustrates the contribution level of the leadership dimension by all sample segments; it shows that the contribution of leadership readiness on enterprise readiness ranges from 19% to 35%.



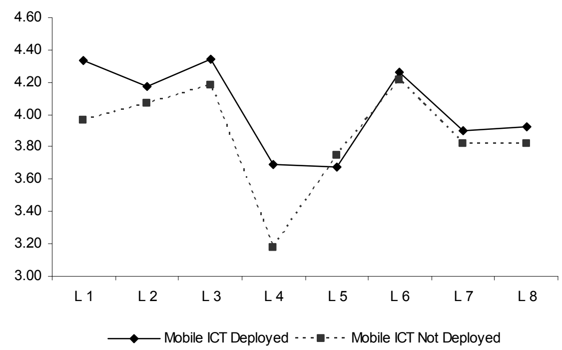
(a) Academics vs. Industry



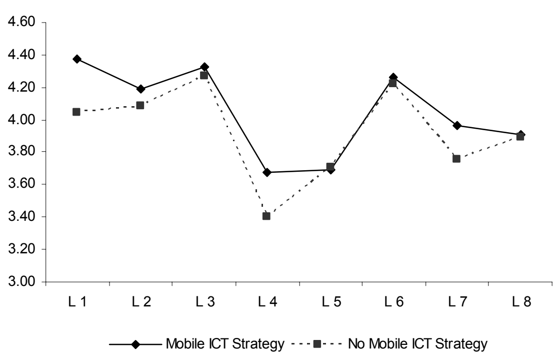
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 69. Mean Group Responses, Leadership Assessment Indicators

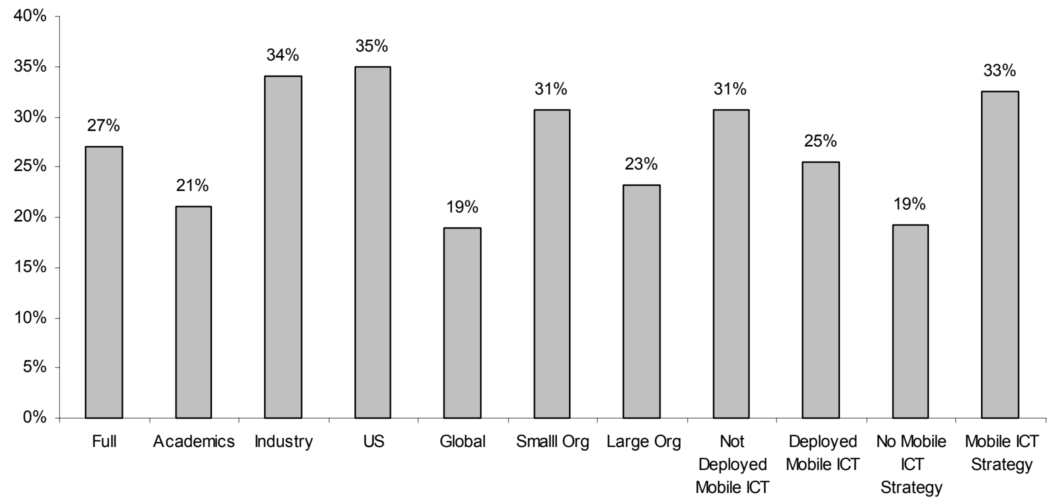


Figure 70. Contribution of Leadership Readiness on Enterprise Readiness

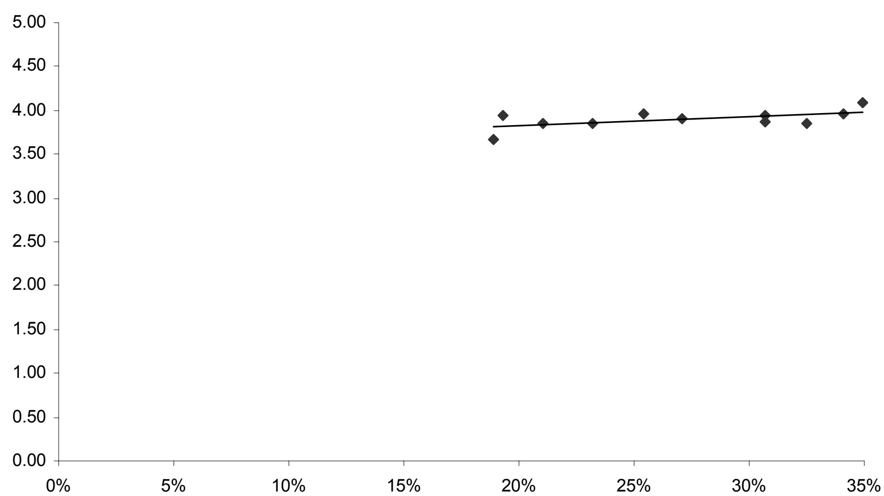


Figure 71. Leadership Readiness – Comparison of Phase 2, Section 1 and 3

While our initial analysis revealed that the contribution of leadership readiness on enterprise readiness is 27%, respondents from small organizations (31%) and those respondents from organizations with a mobile ICT strategy (33%) tended to rate leadership readiness much higher than their counterparts..

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 71). We can observe that there is some dispersion of the data points, indicating that respondents evaluated the leadership dimension in the readiness profiles moderately different than in Section 1.

7.4.6. Employee

In Section 1 of Phase 2 we asked participants to rate the importance of Employee Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 43 provides the descriptive statistics for the relative importance of employee readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.523 out of 5.000, indicating an overall moderate level of importance.

An examination at the various sample segments indicates no significant differences in mean responses.

Table 43. Descriptive Statistics (Employee) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.523	3.517	3.529	3.492	3.563	3.585	3.464
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.878	0.843	0.924	0.924	0.823	0.842	0.914
Variance	0.770	0.710	0.854	0.854	0.677	0.709	0.835
Minimum	1	2	1	1	2	2	1
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.519	3.536	3.547	3.489
Median	4.000	4.000	4.000	4.000
Std. Deviation	0.882	0.881	0.815	0.968
Variance	0.778	0.776	0.664	0.937
Minimum	1	2	2	1
Maximum	5	5	5	5

Figure 72 graphically depicts the aforementioned mean responses of all sample segments.

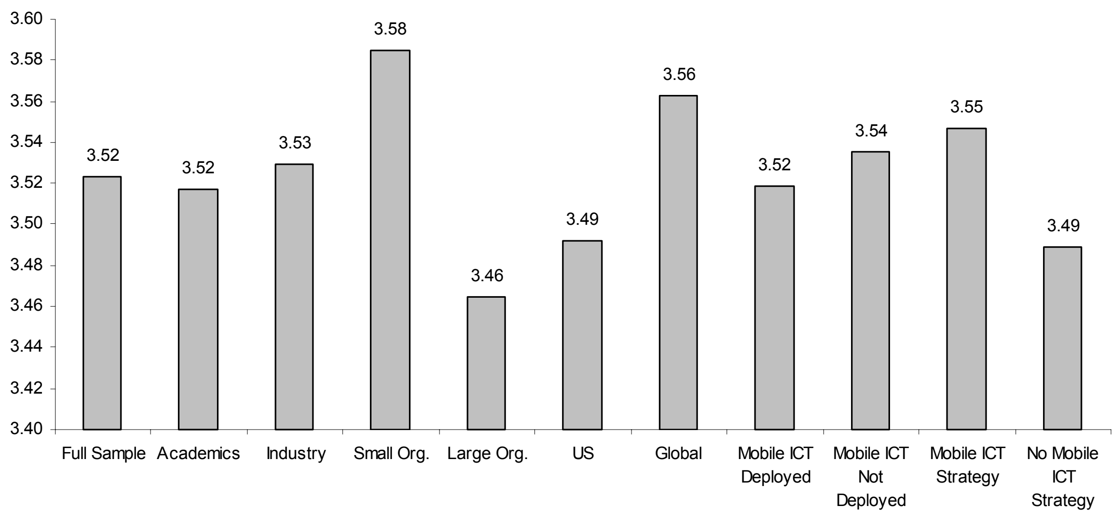


Figure 72. Mean Response, Relative Importance of Employee Readiness

In Section 2 of Phase 2, we explored the employee dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of employee readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Employee Readiness tend to …

E 1. Have employees that are innovative and risk-oriented.
E 2. Have employees with a low resistance to change.
E 3. Have employees that are motivated to use mobile ICT.
E 4. Have employees with a positive attitude towards mobile ICT.
E 5. Have employees with significant ICT skills and experience.
E 6. Have employees with high degree of learning capabilities.

Table 44 provides the descriptive statistics for the entire expert sample (n=109) for each of the six employee readiness assessment areas.

Table 44. Descriptive Statistics (Employee) - Phase 2, Section 2

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	109	109	109	109	109	109
Missing	0	0	0	0	0	0
Mean	3.523	3.624	4.138	4.055	3.422	3.936
Median	4.000	4.000	4.000	4.000	3.000	4.000
Std. Deviation	0.834	0.921	0.645	0.678	0.808	0.711
Variance	0.696	0.848	0.416	0.460	0.654	0.505
Minimum	2	1	2	2	2	2
Maximum	5	5	5	5	5	5

The two highest levels of agreement for the full sample were with the statements that employee-ready organizations tend to have employees that are motivated to use mobile ICT (E3, Mean Response: 4.138), have employees with a positive attitude towards mobile ICT (E4, Mean Response: 4.055), and have employees with high degree of learning capabilities (E6, Mean Response: 3.936). Figure 73 illustrates the mean responses for each of the six employee readiness assessment areas for our full sample set.

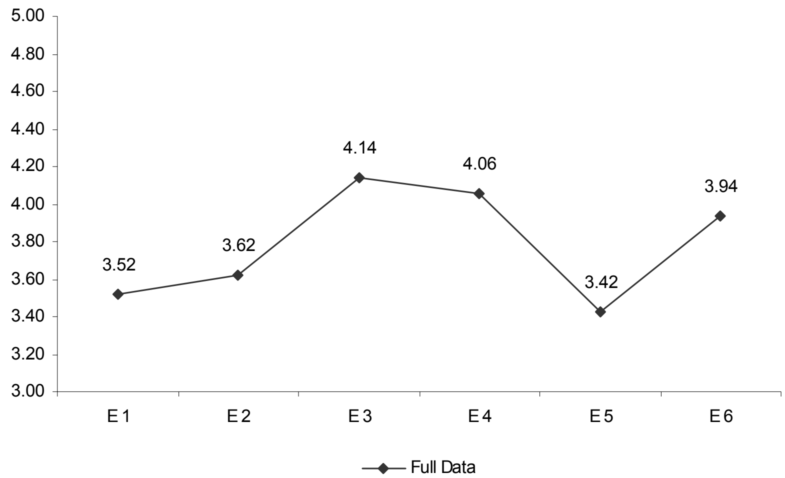


Figure 73. Mean Response (Full Sample), Employee Assessment Indicators

A closer look at the group comparisons depicted in Figure 74 (a-e) reveals several additional insights:

- The mean level of agreement of respondents from organizations that have mobile ICT deployed for all employee readiness assessment indicators (E1 – E6) tend to be higher than the mean level of agreement of respondents from organizations that did not have mobile ICT deployed.

- The same observation can be made for respondents from organizations that have a mobile ICT strategy versus those that do not.

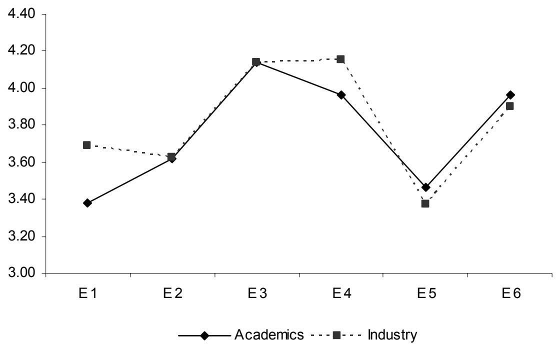
- Industry experts' mean level of agreement with the statement that employee-ready organizations have employees that are innovative and risk-oriented (E1) differed moderate significantly from academic respondents (p=0.055).

- US-based respondents' mean level of agreement with the statement that employee-ready organizations have employees with significant ICT skills and experience (E5) differed moderate significantly from global respondents ($p=0.062$).

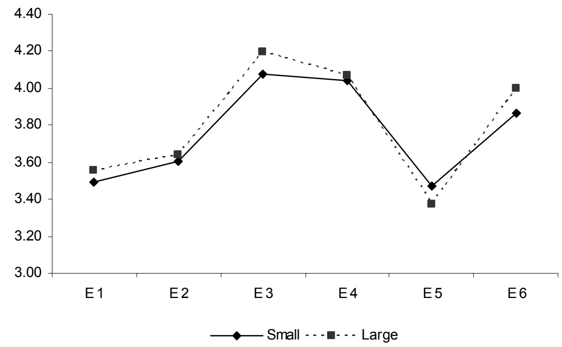
- The mean level of agreement of respondents that have mobile ICT deployed with the statement that employee-ready organizations have employees that are innovative and risk-oriented (E1) differed significantly from respondents of organizations that did not have mobile ICT deployed ($p=0.017$).

- Similarly, the mean level of agreement of respondents that have a mobile ICT strategy with the statement that employee-ready organizations have employees that are innovative and risk-oriented (E1) differed significantly from respondents of organizations that did not have a mobile ICT strategy ($p=0.047$).

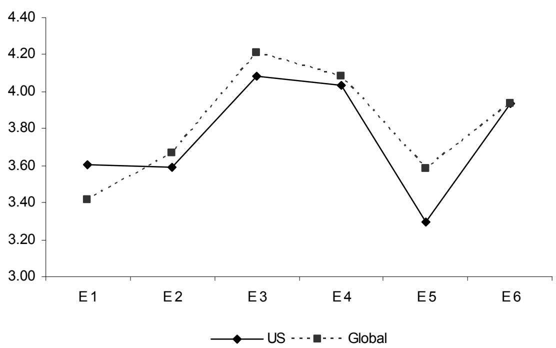
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of employee readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (8%). Figure 75 illustrates the contribution level of the employee dimension by all sample segments; it shows that the contribution of leadership readiness on enterprise readiness ranges from 7% to 10%.



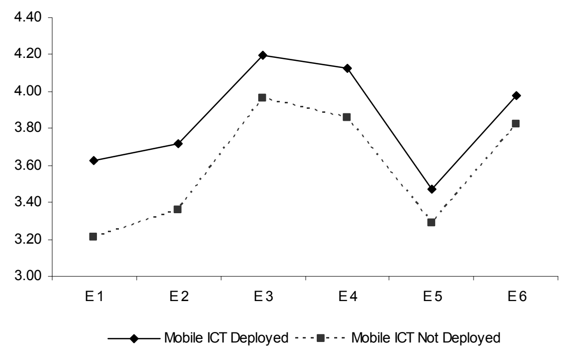
(a) Academics vs. Industry



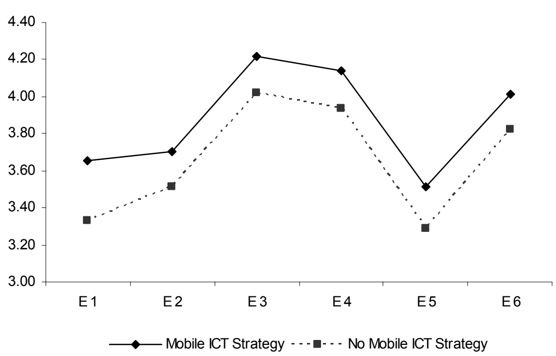
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 74. Mean Group Responses, Employee Assessment Indicators

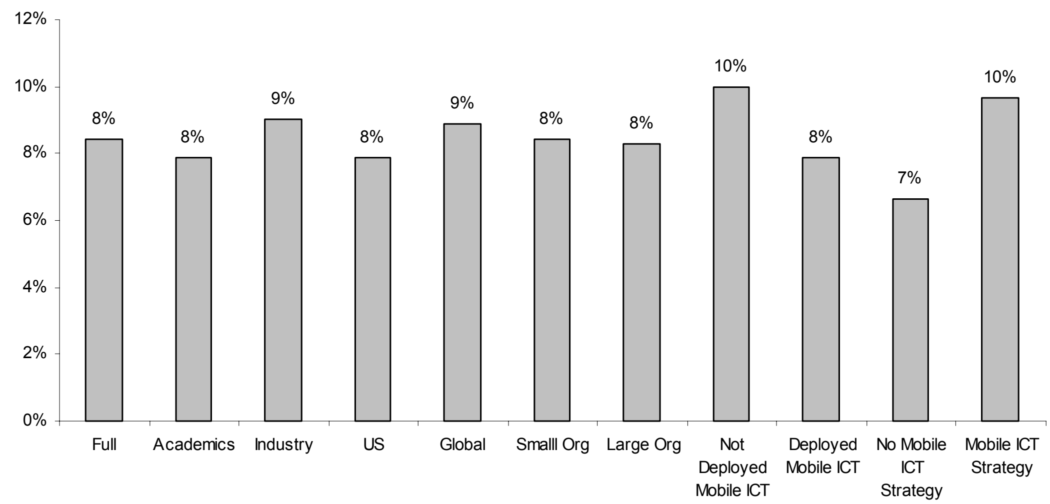


Figure 75. Contribution of Employee Readiness on Enterprise Readiness

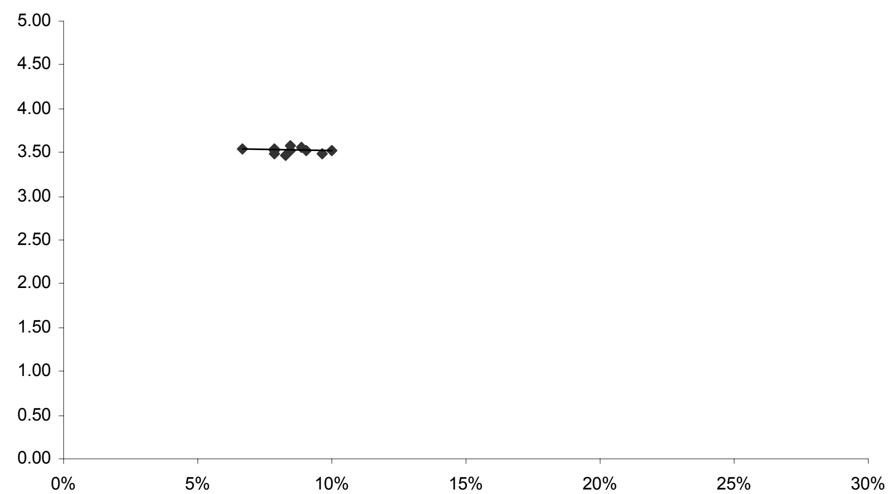


Figure 76. Employee Readiness – Comparison of Phase 2, Section 1 and 3

While our initial analysis revealed that the contribution of employee readiness on enterprise readiness is 8%, respondents from organizations that did not have mobile ICT deployed (10%) rated employee readiness marginally higher than those that had (8%).

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 76). We can observe that there is some dispersion of the data points, indicating that respondents evaluated the employee dimension in the readiness profiles moderately different than in Section 1.

7.4.8. Values & Goals

In Section 1 of Phase 2 we asked participants to rate the importance of Values & Goals Readiness when planning for mobile ICT on a five-point Likert scale (1=Not Important, 5=Critical). The data in Table 45 provides the descriptive statistics for the relative importance of values & goals readiness. In particular, it shows that the mean response to the question of the relative importance of this dimension by the full sample was 3.330 out of 5.000, indicating an overall moderate level of importance.

An examination at the various sample segments indicates no significant differences in mean responses.

Table 45. Descriptive Statistics (Values & Goals) - Phase 2, Section 1

	Full	Academics	Industry	US	Global	Small	Large
N valid	109	58	51	61	48	53	56
Missing	0	0	0	0	0	0	0
Mean	3.330	3.276	3.392	3.377	3.271	3.396	3.268
Median	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Std. Deviation	0.903	0.894	0.918	0.860	0.962	0.884	0.924
Variance	0.816	0.800	0.843	0.739	0.925	0.782	0.854
Minimum	1	1	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
N valid	81	28	64	45
Missing	0	0	0	0
Mean	3.309	3.393	3.391	3.244
Median	3.000	3.000	3.000	3.000
Std. Deviation	0.917	0.875	0.919	0.883
Variance	0.841	0.766	0.845	0.780
Minimum	1	2	2	1
Maximum	5	5	5	5

Figure 77 graphically depicts the aforementioned mean responses of all sample segments.

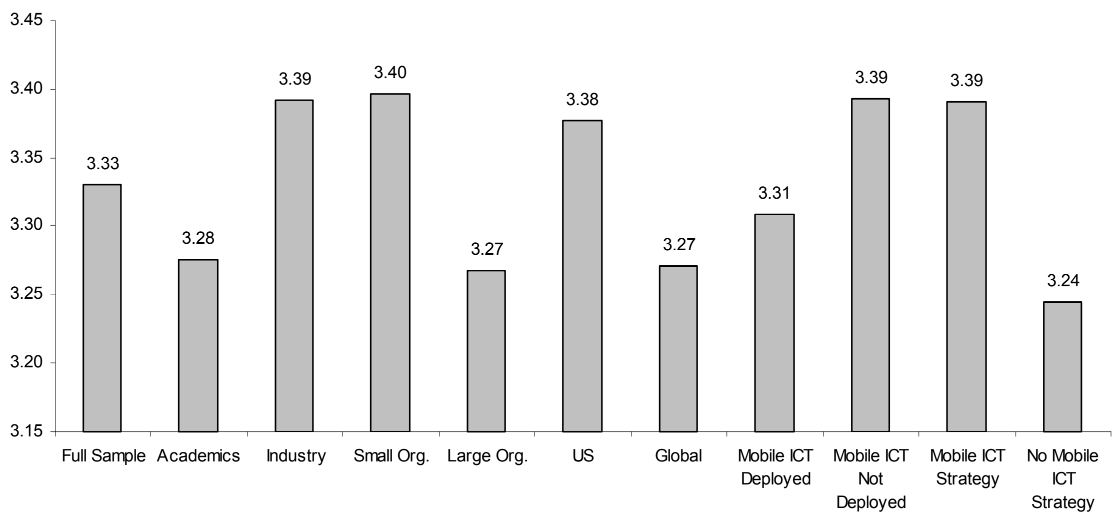


Figure 77. Mean Response, Relative Importance of Values & Goals Readiness

In Section 2 of Phase 2, we explored the values and goals dimension in a little more depth. In particular, we asked respondents to rate their level of agreement with a series of statements that described key assessment indicators of values and goals readiness on a five-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). For review purposes, recall the following statements:

Organizations that exhibit a high level of Values and Goals Readiness tend to …

- V&G 1. Have an organizational environment that embraces and encourages ICT innovation.
- V&G 2. Have an organizational culture that is risk-oriented.
- V&G 3. Have an organizational culture that embraces top-down, bottom-up, and lateral communication.
- V&G 4. Have an organizational climate characterized by mutual trust among its members.
- V&G 5. Have a shared and communicated strategic vision of ICT innovation.
- V&G 6. Have an organizational environment that values quality.
- V&G 7. Have an organizational culture that aligns rewards and incentives with ICT innovation

Table 46 provides the descriptive statistics for the entire expert sample (n=109) for each of the seven values & goals readiness assessment areas.

Table 46. Descriptive Statistics (Values & Goals) - Phase 2, Section 2

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	109	109	109	109	109	109	109
Missing	0	0	0	0	0	0	0
Mean	4.009	3.257	3.761	3.780	3.807	3.817	3.642
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.674	0.738	0.732	0.832	0.751	0.709	0.877
Variance	0.454	0.545	0.535	0.692	0.564	0.503	0.769
Minimum	2	2	2	2	2	2	1
Maximum	5	5	5	5	5	5	5

The highest levels of agreement for the full sample were with the statement that values and goals-ready organizations tend to have an organizational environment that embraces and encourages ICT innovation (V&G1, Mean Response: 4.009). Figure 78 illustrates the mean responses for each of the six employee readiness assessment areas for our full sample set.

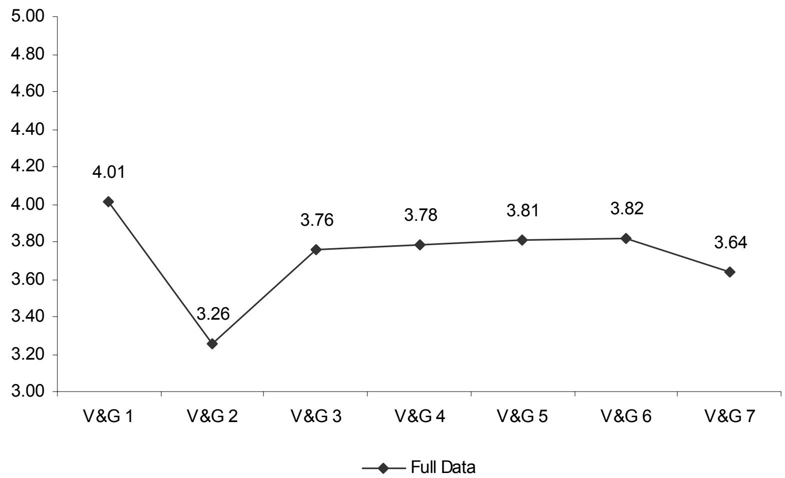
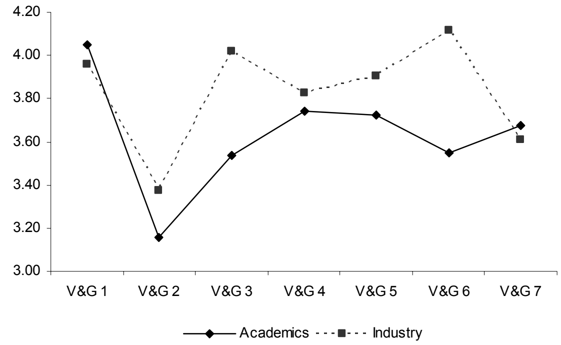


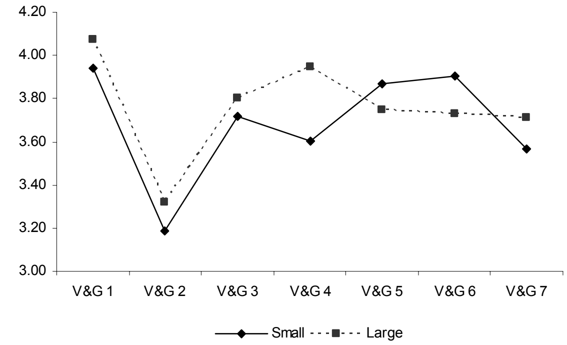
Figure 78. Mean Response (Full Sample), Values & Goals Assessment Indicators

A closer look at the group comparisons depicted in Figure 79 (a-e) indicates no significant differences.

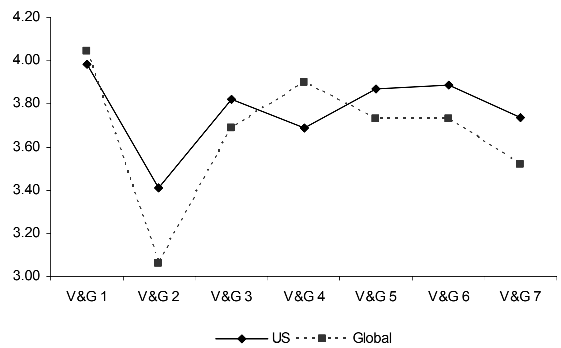
In contrast to Section 1 of Phase 2, where respondents rated one dimension at a time, Section 3 provided a holistic profile of all dimensions, and respondents were asked to rate the level of enterprise readiness depicted by the profile on a five-point Likert Scale (1=Very Low, 5=Very High). Based on our analysis presented in Section 7.3., we were able to infer the contribution of values and goals readiness to the overall enterprise readiness for mobile ICT by examining the ANOVA table (2%). Figure 80 illustrates the contribution level of the values and goals dimension by all sample segments; it shows that the contribution of leadership readiness on enterprise readiness ranges from 1% to 4%.



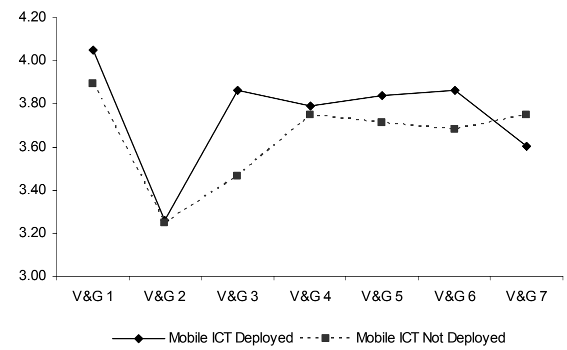
(a) Academics vs. Industry



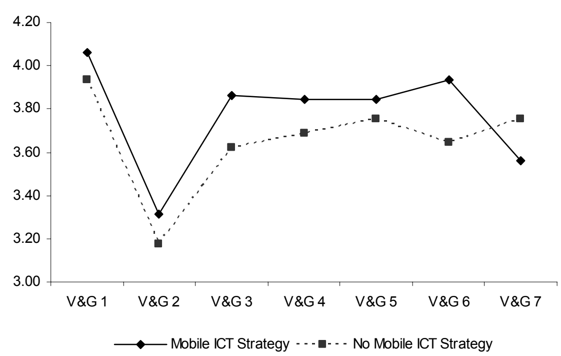
(b) Small vs. Large



(c) US vs. Global



(d) Mobile ICT Deployed vs. Not Deployed



(e) Mobile ICT Strategy vs. No Strategy

Figure 79. Mean Group Responses, Values & Goals Assessment Indicators

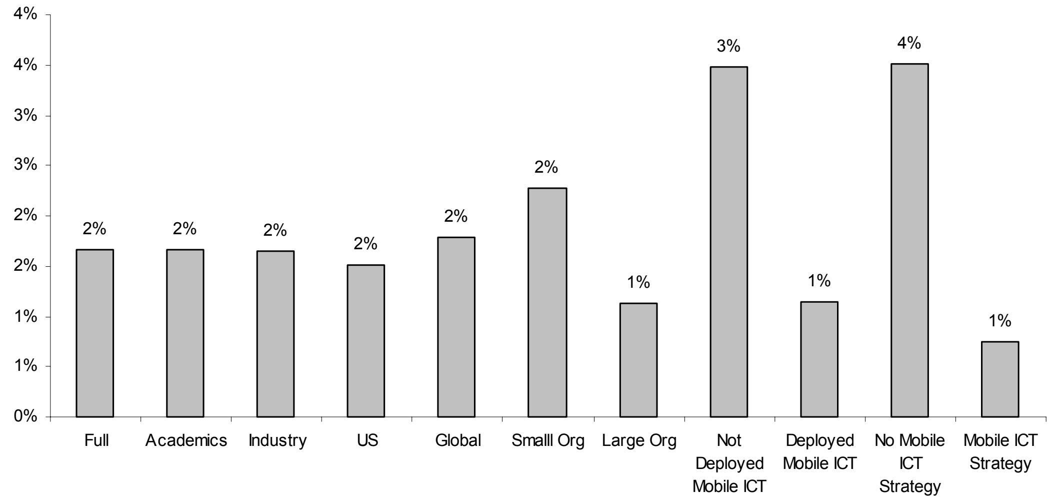


Figure 80. Contribution of Values & Goals Readiness on Enterprise Readiness

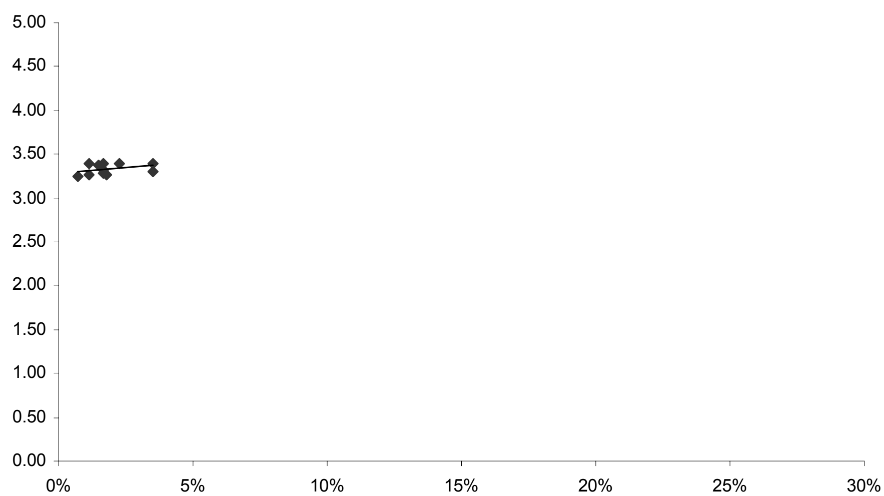


Figure 81. Values & Goals Readiness – Comparison of Phase 2, Section 1 and 3

While our initial analysis revealed that the contribution of values and goals readiness on enterprise readiness is 2%, respondents from organizations that did not have mobile ICT deployed (3%) or had a mobile ICT strategy (4%) rated values and goals readiness marginally higher than their counterparts

In order to get a sense how these results relate to the responses obtained in Section 1 of Phase 2, we plotted these contribution results to the relative importance mean responses (see Figure 81). We can observe that there is some dispersion of the data points, indicating that respondents evaluated the values and goals dimension in the readiness profiles moderately different than in Section 1.

7.7. Discussion of Key Findings

In the previous sections we presented our data analysis and results. In the following section we will summarize and discuss our major findings and put them into the context of our overall research objectives.

It is evident from a first glance at our results that all readiness dimensions proposed in our conceptual model play a very important role in determining enterprise readiness for mobile ICT. All of our hypotheses are supported, confirming that higher levels of dimensional readiness indeed lead to higher level of enterprise readiness for mobile ICT (see Table 47).

Table 47. Summary of Hypotheses and Results

Hypothesis	Proposition Supported?
H1: Greater technology readiness will positively influence enterprise readiness for mobile ICT	Yes
H2: Greater data and information readiness will positively influence enterprise readiness for mobile ICT	Yes
H3: Greater process readiness will positively influence enterprise readiness for mobile ICT	Yes
H4: Greater knowledge readiness will positively influence enterprise readiness for mobile ICT	Yes
H5: Greater resource readiness will positively influence enterprise readiness for mobile ICT	Yes
H6: Greater leadership readiness will positively influence enterprise readiness for mobile ICT	Yes
H7: Greater employee readiness will positively influence enterprise readiness for mobile ICT	Yes
H8: Greater values and goals readiness will positively influence enterprise readiness for mobile ICT	Yes

Our main regression model (1) for the full sample reveals several important observations. First and foremost, it confirms that the leadership dimension contributes the most to enterprise readiness with 27% (see Figure 40). It is followed by Technology (17%), Data and Information (13%), Resources (12%), and Processes (10%). While the other dimensions may not contribute as highly as the aforementioned dimensions, all readiness dimensions are significant at less than the 1% level. Our analysis also revealed a very high R^2, leading to the conclusion that the dimensions included in the overall model describe enterprise readiness for mobile ICT well. Further examination of the interaction plot does not reveal anything further, which is to be expected due to the high variance explained by the main effects.

Table 48. Regression Model Fit Statistics

	Academics	Industry	US	Global	Small
S	0.0899710	0.115057	0.100890	0.080914	0.105738
R^2	98.0%	96.7%	97.2%	98.4%	97.3%
Adjusted R^2	97.1%	95.3%	95.9%	97.7%	96.2%

	Large	Mobile ICT Deployed	Mobile ICT Not Deployed	Mobile ICT Strategy	No Mobile ICT Strategy
S	0.100379	0.0944583	0.128120	0.0914926	0.111108
R^2	97.4%	97.8%	96.2%	98.0%	97.0%
Adjusted R^2	96.3%	96.8%	94.5%	97.1%	95.6%

While the full sample model certainly provides insight to the salient dimensions of enterprise readiness and their relative importance, we gain a deeper understanding by examining the subgroups of our sample. First it should be noted that all subgroup regression models also have a very high R^2 leading to the conclusion that the dimensions included in the models explain a large percentage of the variance. Table 48 shows a summary of the S, R^2 and adjusted R^2 for each subgroup.

For summary purposes, we have integrated all of our key results from our sample segment analysis in Table 49 and Table 50. Table 49 shows the results for only the significant group interactions for enterprise readiness dimension. The group presented in the Table reflects the sample segment with the larger contribution. Similarly, we present significant group interactions for the evaluation of readiness assessment indicators in Table 50. The group included in the table also reflects the sample segment with the higher response to that assessment indicator. Significant differences are displayed at the 1%, 5%, and 10% level and are denoted with one, two, or three stars respectively.

Table 49. Significant Group Differences at the Dimensional Level

	G 1	G 2 **	G 3	G 4	G 5 **
Technology		Global ***			No Strategy ***
Data & Info					
Processes					
Knowledge					
Resources					
Leadership	Ind **			Not Deployed ***	Strategy ***
Employees					
Values & Goals					No Strategy **

* p< 0.1
** p < 0.05
*** p < 0.01

Table 50. Significant Group Differences at the Indicator Level

Indicator	Assessment Area	G 1	G 2	G 3	G 4	G 5
T 1	Open Standards and Interfaces	Ind **	US ***		Deployed *	
T 2	Flexibility and Modularity	Ind **			Deployed *	
T 3	Adaptability and Scalability		US *			
T 4	Availability, Reliability, and Security	Ind **				
DI 2	Ability to Protect, Secure, and Recover Enterprise Data	Ind *	US ***			
P 2	Adaptive Business Processes					Strategy **
P 5	Formalized Governance, Decision-Making, and Resource-related Processes					Strategy **
P 6	Quality and Extent of Documentation					Strategy *
K 2	Understanding of Regulatory Requirements				Deployed ***	Strategy ***
K 5	Previous Experience with ICT implementations				Deployed *	
K 8	Encouragement to pursue Continuous Education and Knowledge Advancement			Large **		
R 3	Sufficient Number of ICT Experts			Large *		
R 6	Availability of ICT Champions		US **			
L 1	Ability to Articulate Strategic Vision				Deployed *	Strategy **
L 4	Previous Experience with ICT Implementations				Deployed ***	Strategy **
L 5	Innovativeness and Risk-Orientation		US *			
E 1	Innovativeness and Risk-Orientation	Ind *			Deployed **	Strategy **
E 5	Skills and Experience		Global *			
VG 2	Risk-Oriented Organizational Culture		US **			
VG 3	Top-Down, Bottom-Up, and Lateral Communication	Ind ***			Deployed **	
VG 4	Mutual Trust among Members			Large **		
VG 6	Embrace Quality	Ind ***				

* $p< 0.1$
** $p < 0.05$
*** $p < 0.01$

Academics vs. Industry

At the group level, we found no significant difference between academic and industry respondents. At the dimensional level, however, we did find a significant difference in leadership. Industry respondents tend to rate the contribution of leadership to enterprise readiness significantly higher than academic respondents. This result validates what has become a common observation in practice today; leadership and their ability to articulate the vision, manage, and execute on innovations has become an extremely important aspect of organizations today. According to the recent IBM Global Innovation Study, leadership is more involved in the innovation initiatives of organizations (IBM, 2006). Indeed, most innovative organizations tend to have leaders that commit to and support innovations.

Another observation that can be seen between academics and industry respondents is that academic respondents tend to rate technology, data and information, and processes higher than industry respondents. This is also not a surprising result; in fact, it reinforces the knowledge that we already have of the academic perspective. Academics tend to think in conceptual terms; they often are more concerned on what tangible elements are important in facilitating the adoption and implementation of new technologies and improving its overall enterprise readiness. Indeed, technology, processes, and data and information are what most academics view as the infrastructure building blocks of enterprise readiness.

At the assessment indicator level we also see several interesting differences between academics and industry. For the technology dimension, industry rates open standards and interfaces (T1), flexibility and modularity (T2), and availability, reliability, and security (T4) significantly higher than academics. This is an indication that industry is very much concerned about organizational agility to changing environments. Open standards and interfaces enable organizations to easily scale and deploy new systems. Flexibility and modularity is directly associated to organizational agility as well. In recent years, security and reliability of technology infrastructure has become increasingly important. The fact that industry rates this assessment indicator higher is evidence that more attention is paid to ensuring availability and contingency plans for technology.

The ability to respond to changing environments is also highlighted in the significant differences along the data and information dimension. Industry respondents rate the capability to protect, secure, and recover (DI2) enterprise data significantly higher than academics. It is clear that the fear of losing critical data and information is much more pronounced by industry respondent.

It is also interesting to note that industry rates organizational cultures that embrace top-down, bottom-up, & lateral communication (VG3) and quality (VG6) significantly higher than academics. In theory, communication and quality are often considered critical aspects of a innovative organizational culture. However, more emphasis is generally placed on trust and risk-orientation. In practice, however, organizational cultures that embrace unilateral communication seem to play a much more profound role.

US vs. Global

At the group level, we found there to be a significant difference between US and Global respondents. We attribute this difference in enterprise readiness to varied views and approaches to leadership styles and importance of technology infrastructure. The significant differences in views on enterprise readiness tend to highlight the different approaches of preparing organizations for change. Whereas US organizations are concerned about leadership for change, global respondents place greater emphasis on other organizational aspects, such as technology infrastructure.

This proposition is indeed validated by the significant difference in technology readiness. Global respondents tend to rate technology readiness significantly higher than US respondents. It may also be attributed to the extensive diffusion of IT in US organizations in general and that technology has almost become a commodity. On the contrary, we can also hypothesize that most global companies may believe that technology is the distinguishing factor.

An equally stark, but not significant, difference can be observed along the leadership dimension. US respondents (35%) tended to value leadership readiness much more important than global respondents (19%). This, to a certain extent, can be explained by Hofstede's view on differing leadership styles across the world (Hofstede, 1980). While US respondents may see leadership to be the critical element in organizational readiness, global respondents believe that leadership is not as important as other aspects of the enterprises, namely technology and resources. This can be partially explained that leadership styles may vary significantly in the US and has become a distinguishing trait of US organizations in contrast to global companies.

In order to understand why this significant difference in magnitude occurred, we examined the demographic distribution of our global respondents further. It shows that a majority of our global respondents come from Western European region. Here, mobile ICT technology has diffused significantly and is very mature. We hypothesize that global leadership has had more experience with integrating emerging technologies such as mobile ICT than leadership in the US, thus placing less emphasis on leadership and more on technology. This issue is certainly open to debate and requires further examination.

At the assessment indicator level, we find several significant differences between US and global respondents. US respondents tend to rate open standards and interfaces (T1) and adaptability and scalability (T3) of technology infrastructure significantly higher than global respondents. Again, emphasis is placed on agility and flexibility. Another difference was found along the data and information readiness dimension. US respondents tend to rate the ability to protect, secure, and recover enterprise data (DI2) significantly higher than global respondents. This is an interesting observation, and requires further investigation. Preliminary analysis indicates that data information and security has become a much more serious issue in the US. Given the increase in regulatory audits and certification, such as Sarbanes-Oxley, we can argue that US organizations are forced to pay more attention to data and information protection, recovery, and security, whereas Global companies may have not received such mandates yet.

Along the leadership dimension, we find a significant difference in how US respondents rate innovativeness and risk orientation of leadership (L5) in contrast to global respondents. This difference may be explained by the deeply embedded cultural differences to risk taking in general. Given our demographic distribution of our global respondents, we can potentially infer that risk taking is not as valued as often prohibited in corporate decisions in many parts of the world. However, innovation in the US is often triggered by risk-oriented leadership. Further examination may be required here.

Along the employee dimension, we find an interesting significant difference. Global respondents tend to rate employee skills and experience (E5) significantly higher than US respondents. This can attributed to the fact that global companies do not often operate in a “hire-and-fire” system; employees tend to stay with companies for a very long time. Thus, selection of employees with strong skills and experience is much more important since employee turnover is lower in the non-US regions of the world. In the US, companies tend to hire and/or fire employees more frequently. New employees with required skills and experience can be obtained much faster.

We also found a significant difference along the values and goals dimension. US respondents tend to rate an organizational culture that is risk oriented (VG2) significantly higher than global respondents. There is substantial theoretical evidence that organizational cultures are shaped by environmental and social norm influences. Social norms, values, and attitudes have been shown to vary from country to country. Risk orientation is generally deeply embedded in a social culture. In many cases in the world, an “inert” culture is quite common. An “inert” organizational culture tends to based in on conservative, cautious and risk adverse behavior. This also leads to an organization that is slow to accept change or adapt to sudden situations. This organizational mentality is deeply rooted in the organizational culture of many global organizations and thus may explain the significant difference in risk orientation between US and global organizations.

Small vs. Large Organizations

While there is no significant difference between respondents from small and large organizations and the majority of dimensions have similar magnitudes in contribution to enterprise readiness for mobile ICT, it is interesting to observe the relatively large difference in contribution magnitude along the resource dimension. Respondents from large organizations tend to rate resource readiness much larger than respondents from smaller organizations. This may be attributed to the difficulties associated with managing and allocating resources in large enterprises. Deployments of ICT in larger organizations tend to be significantly larger in scope, size, and cost. As such more resources must be allocated to ICT projects in large organizations.

Another argument that can be made for this observation is that smaller organizations may find it easier to allocate resources for emerging ICT projects due to lower number of conflicting ICT projects. The business value can be justified easier in smaller organizations where the impact can be measured more accurately. The impact of mobile ICT in large organizations may also be substantial, however, the business value justification, particularly in existence with competing projects, is often more difficult to achieve.

While no statistically significant differences where found at the dimensional level, several significant differences between large and small organizations are observed at the assessment indicator level. Respondents from large organizations tend to rate encouragement of continuous education and knowledge advancement by its members (K8) significantly higher than respondents from small organizations. This can be partially explained by the fact that in order for large organizations to attract and retain a skilled workforce, many organizations must offer employees incentives, one of which is continuing education programs. Organizations recognize that that money spent on training employees is more an investment rather than a cost. A more skilled workforce results in increased economic productivity. Large organizations thus encourage their employees to participate in knowledge advancement and continuing/extra credit education programs.

It is not surprising that respondents from large organizations also tend to rate the availability of sufficient number of ICT experts in the organizations (R3) significantly higher than respondents from small organizations. Similarly to the argument of resource availability, mobile ICT projects in large organizations tend be much broader in scope, larger in size, and require significant financial support if implemented enterprise wide. As the project scope and size grows, a larger number of ICT experts can help achieve timely implementations and overall project success.

Lastly, we also find a significant difference within the values and goals dimension. Respondents from large organizations tend to rate an organizational climate with mutual trust among its members (VG4) significantly higher than respondents from small organizations. This difference may be explained by the fact that large organizations tend to have well-defined roles and responsibilities and hierarchies often exist. The introduction of mobile ICT into large enterprises can transform these roles, responsibilities, and interactions between members significantly. If face-to-face contact with the manager first thing in the morning was common, this routine is disrupted when employees start the work day in the field or out of the office. Managers may be unwilling to give up the control they think they may have by keeping employees where they can be seen. While in small organizations, employees may generally know each other, an employee in a large organization can easily be lost among the pool of people. In order to get work done and keep employees satisfied and empowered, trust among members is thus a vital element for a mobile organization. This often means that managers must change their views of “managing” and allow their workers a higher level of action freedom. Employees must be able to count on each other to do their share of the work. That can be difficult for people who have never met and worked face-to-face, and who therefore know little about one another's capabilities, experience, personal quirks, as is the case in large organizations.

Mobile ICT Deployed vs. Not Deployed

The comparison of organizations that have mobile ICT deployed versus that did not reveal any significant difference at the group level. Leadership was rated significantly higher by organizations that did not have mobile ICT deployed at the dimensional level. Given that organizations with mobile ICT did not rate leadership as high, it may be an indication that once organizations have deployed mobile ICT, leadership is not that important. Along the same lines, this highlights that prior to adoption and implementation, leadership is significantly more important. Other significantly different dimensions include technology readiness and resource readiness; both of these dimensions were rated higher by respondents from organizations with mobile ICT deployment. This is an indication that organizations without mobile ICT deployment may underestimate the importance of having both adequate financial and human resources available, and place more emphasis on leadership readiness. One conclusion that can be drawn from this contradictory result is that dimensional readiness may have to be considered as a whole and not piecewise.

A closer examination of significant differences at the assessment indicator level reveals several other interesting results. Respondents from organizations that have deployed mobile ICT tend to rate open standards and interfaces (T1) and flexibility and modularity (T2) of technology infrastructure significantly higher than respondents from organizations that have not. This relates back to the fact that mobile ICT is often based on existing technology infrastructure; in order to ensure a smooth implementation process of mobile ICT, open standards, flexibility, and modularity can significantly help.

Respondents from Organizations that have deployed mobile ICT also tend to rate the understanding of regulatory requirements (K2) and previous experience with ICT implementations (K5) significantly higher than respondents from organizations that have not. Again, this reflects the idea that mobile ICT projects are novel and unique and require a good understanding of its associated challenges, opportunities, and barriers. Previous experience with ICT implementations can thus facilitate the adoption and implementation process of mobile ICT.

Understanding regulatory requirements is also a very important aspect when implementing new ICT. How will mobile ICT change the way data is used, shared, and stored? Given that compliance is no longer an issue only for select companies, but has emerged as a challenge for organizations—of all sizes, in all industries—adherence to regulations that address the confidentiality, integrity and availability of information may be significantly altered when implementing a transformative technology such as mobile ICT. As such it is quite clear why organizations that have implemented mobile ICT and have an associated strategy tend to rate an understanding of regulatory requirements to be an important aspect of knowledge readiness.

Transformative ICT also require leadership that can lead the way. It is therefore not a surprise that respondents from organizations that have deployed mobile ICT tend to rate the ability of leadership to clearly articulate the strategic vision (L1) and leadership's previous experience with ICT (L4) significantly higher than respondents from organizations that have not deployed mobile ICT. Both strategic vision and experience can facilitate the mobile ICT adoption process and prepare leaders to steer the organizations through potentially transformative changes.

Given that mobile ICT are new and emerging, it is not surprising that respondents from organizations that have deployed mobile ICT tend to rate employees' innovativeness and risk-orientation (E1) significantly higher than respondents from organizations that have not deployed mobile ICT. Both innovativeness and risk-orientation facilitate a smoother individual adoption process. The more innovative employees are, the more likely they are to use something new. Similarly, risk-oriented employees tend to deviate from their routine job processes and are willing to embrace change. Both qualities are shown to be significant contributors to employee readiness by organizations that have deployed mobile ICT.

Mobile ICT Strategy vs. No Strategy

Similar to the comparison between organizations that have mobile ICT deployed and not, a comparison between organizations with and without a mobile ICT strategy reveals some interesting results. We found a statistically significant difference at the group level, indicating that organizations with and without a mobile ICT strategy tend to have varying views on enterprise readiness. In particular, we found that organizations that did not have a mobile ICT strategy tend to rate technology readiness and values and goals readiness significantly higher than organization with a strategy. This leads us to speculate that both technology and values and goals readiness may be overemphasized by organizations without a mobility strategy. The emphasis on technology readiness shows that organizations without a mobility strategy may view technology to be the most significant challenge in the adoption of mobile ICT. Similarly, the emphasis on values and goals readiness indicates that organizations without a strategy view the implementation of cultural changes to be critical.

Not surprising, and in line with our previous results, leadership readiness is clearly rated to be significantly more important by organizations with a mobility strategy. It shows that mobile ICT implementation and adoption requires top management support and buy-in. Leadership readiness ensures that the mobile ICT strategy set forth gets implemented and carried out properly. Based on these results, we can again draw the conclusion that companies that did not have a mobile ICT strategy focused more on the conceptually important aspects of readiness, instead on the "action and execution" dimension of leadership readiness.

At the dimensional level, we found similar significant differences to those found in the comparison of organizations that have and have not deployed mobile ICT.

To recap briefly, respondents from organizations with a mobile ICT strategy tend to rate the understanding of regulatory requirements (K2) significantly higher than respondents from organizations that have no strategy. This is not surprising as compliance has become an integrative aspect of most organizations' ICT strategy.

Respondents from Organizations that have a mobile ICT strategy also tend to rate the ability of leadership to clearly articulate the strategic vision (L1) and leadership's previous experience with ICT (L4) significantly higher than respondents from organizations that have no strategy. This goes in line with our previous results on leadership.

Similarly, respondents from organizations that have a mobile ICT strategy tend to rate employees' innovativeness and risk-orientation (E1) significantly higher than respondents from organizations that have no strategy. The more innovative employees are, the more likely they are to use something new. Similarly, risk-oriented employees tend to deviate from their routine job processes and are willing to embrace change. Both qualities are shown to be significant contributors to employee readiness by organizations that have a mobile ICT strategy

In addition to these differences, however, we also found differences along the process readiness dimension. Respondents from organizations that have a mobile ICT strategy tend to rate adaptive business processes (P2), formalized governance, decision-making and resource-related processes (P5), and high quality and extent of documentation (P6) significantly higher than respondents from organizations that have no strategy. All of these differences support the view that process readiness is important to organizations with a mobile ICT strategy. Formalized decision and resource-related processes enable a successful execution of the mobile ICT strategy. Documentation of processes provides the means to measure, improve, and optimize processes. Having adaptive processes enables organizations to quickly adapt to changing requirements.

7.8. Summary

This chapter presented the data analysis and results for our two phase web-based expert study on enterprise readiness for mobile ICT. Using advanced statistical methods, we were able to extract the validity of our model assumptions and determine the relative importance of each of the eight readiness dimensions. Based on our analysis, we developed predictive regression models that will help us determine an enterprise readiness index based on user responses to the various assessment areas. We also dissected our full sample into various groups of interests and were able to draw several additional conclusions. Our results showed differences in how academics and industry respondents viewed and rated enterprise readiness. Similar observations could be made for respondents from small and large organizations, from the US and abroad, from those that had deployed mobile ICT and not, and from those that have a mobile ICT strategy and those that did not.

The results presented in this chapter provide an excellent basis for future studies. One extension of these results is its implementation into a web-based decision support system. The development of such a system is discussed in the following chapter.

CHAPTER 8:

WEB-BASED READINESS DIAGNOSTIC TOOL

8.1. Introduction

In the previous chapter, we presented the results of our empirical study of the salient dimensions of enterprise readiness and their relative importance. The previous chapter also highlighted that an assessment of mobile ICT readiness requires a consideration of several assessment areas. In order to reduce the complexity of the readiness assessment and provide a more structured approach, it is often common to develop a decision support system (DSS) that guides the decision maker through the decision space and simplifies the assessment process. According to (Turban et al., 2004), a DSS is "an interactive, flexible, and adaptable computer-based information system, specially developed for supporting the solution of a non-structured management problem for improved decision making. It utilizes data, provides an easy-to-use interface, and allows for the decision-maker's own insights." Using the results we obtained from our empirical analysis in Section 7, we thus developed a web-based DSS, called the readiness diagnostic tool (RDT). Based on decision maker responses, the RDT aids the decision maker in the readiness assessment for mobile ICT. It can be used to assess the readiness of an organization, a business unit within the organization, or groups within a department. It can also be used to assess the readiness of potential clients that may want to adopt and implement mobile ICT.

In the following sections, we describe how we developed and implemented the RDT as a Web-based DSS, provide a brief description of the prototype system, and highlight the main features of this system.

8.2. System Architecture and Development of the Web-Based RDT

The RDT is built on the commonly used three-tier architecture model consisting of the client, middle, and database tiers. The top level of the model is the client tier, which includes the Web browser (e.g. MS Internet Explorer, Netscape, Mozilla Firefox, etc.) which interacts with the RDT. The middle tier communicates data to and from the client to the database. The middle tier contains the application logic and scripting engine, which processes user input and database content and sends it back to the front-end, the Web browser. The base level of the RDT is the database tier, which consists of a RDBMS, which handles the data that is created, added, modified, deleted and/or requested by the end-user/s. The RDT was developed using the scripting language PHP and implemented with the open-source MySQL database. The front-end design of the RDT was designed using Macromedia Dreamweaver and Fireworks.

Similar to the development of our web-based expert study, we designed and implemented the RDT for web use for a number of reasons:

- Web-technology enables developers to create a system that allows a single point of access/entry (front-end) through a browser interface and provides the means to access large numbers of external data sources to compute and construct the content in the back-end. Only relevant information is displayed to the end-user, while the engine on the server side performs all the necessary computations.
- The use of a web-based infrastructure enables the user to always have access to the latest version of the RDT. In contrast to a desktop application, where updates must be manually installed, web-based DSS continuously update data and models as they become available and are migrated to production.

- A major advantage of web-based DSS is their ability to be platform independent. The RDT can be developed independent of the type and nature of the end-user computing interface. Development of the tool is thus primarily focused on advancing models and content, instead of creating multiple versions that can run on a wide variety of computing platforms.
- Web-based DSS also enable the researchers to keep track and collect data about end-users and their usage of the system. This allows for easy problem identification, continuous feedback and enhancement possibilities.

8.3. RDT Features and Interaction Flow

The RDT consists of several modules that together generate a summary response for readiness assessment. The latest version (1.02) of the RDT consists of three modules:

- Basic Information
- Assess Readiness
- Compare Readiness

The user can access the RDT at http://rdt.mobilereadiness.info. The interaction flow of the RDT is shown in Figure 82.

The user must first login to access the RDT. If the user does not have a username and password, a new account can be created. If the user already has a username and password, he/she should login using this information. A forgot password page e-mails users a reset password to the e-mail account specified in the account creation.

Once the user logs in, the main page displays a brief overview of the steps involved in readiness assessment (see Figure 83). In order to begin the assessment and move to the first module of the RDT, the user must click on the "Begin Assessment" button.

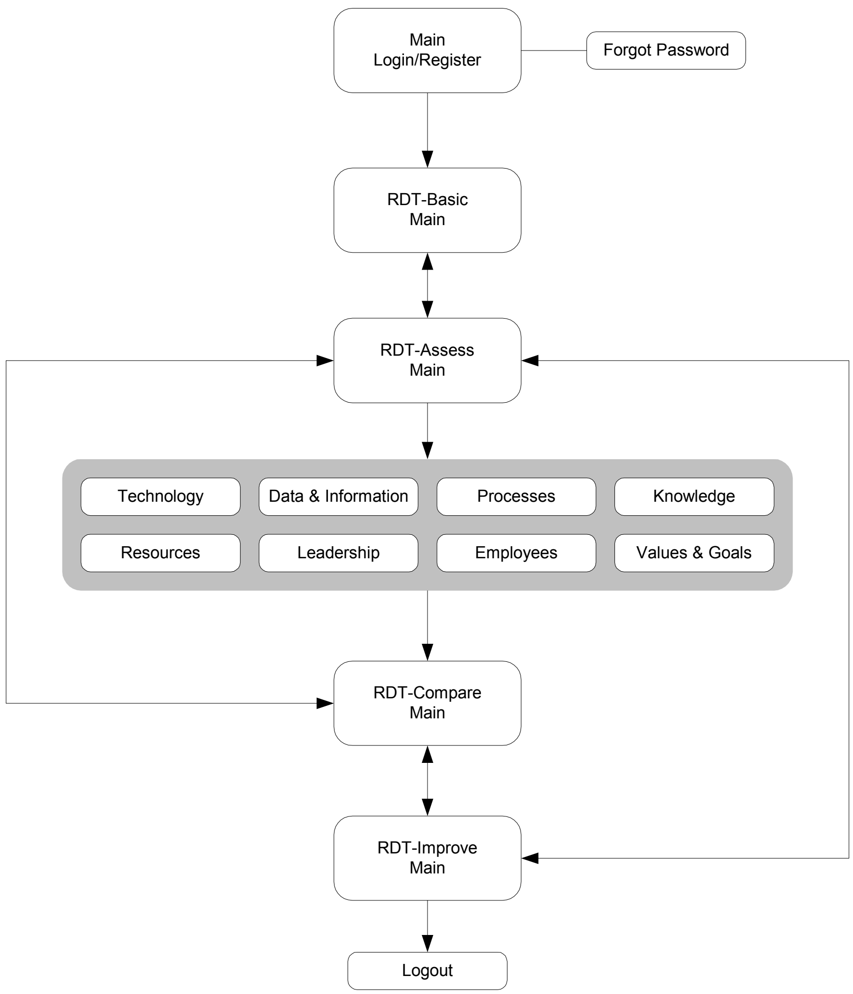


Figure 82. User Interaction Flow Diagram for RDT

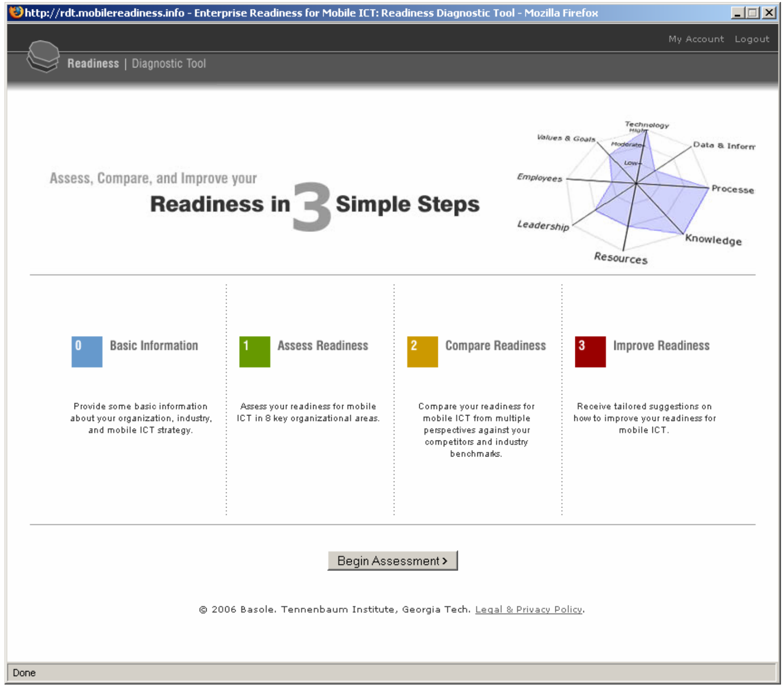


Figure 83. RDT Welcome Screen

8.3.1. Basic Information Module

After the user clicks on "Begin Assessment", the user is taken to the basic information page, where the user provides general information on their organization, the industry the organization is in, an estimated mobile ICT project timeline, project size and scope (see Figure 84). This information is used to generate a more tailored response in the readiness assessment.

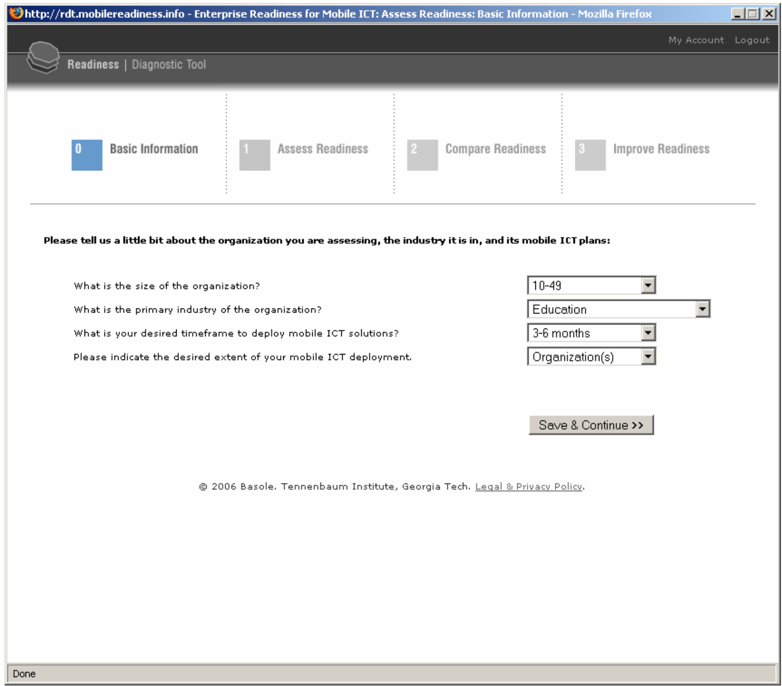


Figure 84. RDT Basic Information Screen

The user is then prompted to save the information and continue to the next section.

8.3.2. Assess Readiness Module

After saving this information, the user is then taken to the main page of the "Assess Readiness" module. Here the user sees a tabbed-interface that displays the eight readiness dimensions and the associated response status (see Figure 85). Users must complete all sections in order to proceed to the next module.

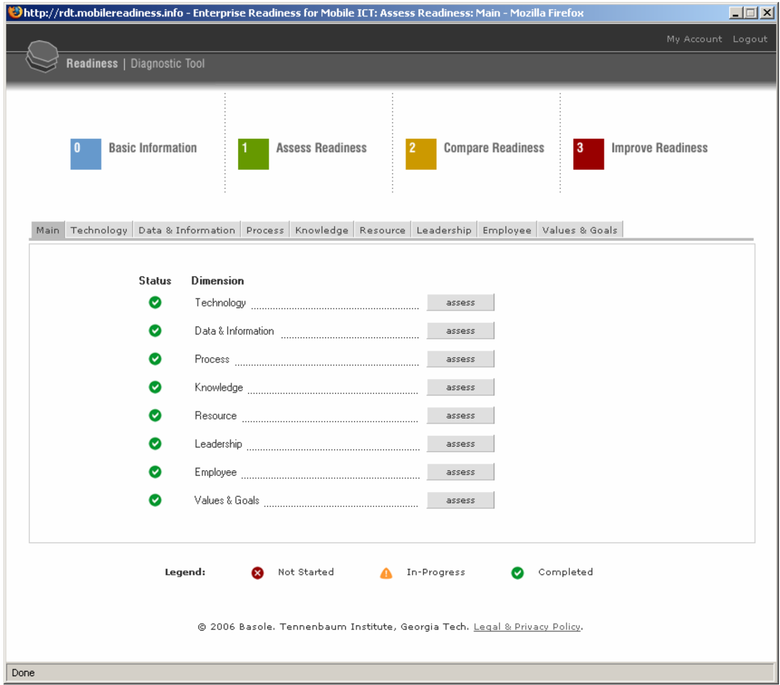


Figure 85. RDT Main Assessment Screen

Each tabbed section contains a questionnaire consisting of a series of assessment indicator statements relevant to a particular readiness dimension. Users are asked to state their level of disagreement or agreement with these statements on a five-point Likert scale. The RDT relies on the judgment of the respondents as to whether or not he/she agrees with the statement/s in the context of their organization, department or work group. The respondent(s) need to ensure that their responses are consistent with their personal beliefs and assumptions e.g. if the responses are in the context of the department (and not the organization), then that assumption must be consistently reflected throughout. The extent to which the respondent agrees or disagrees with a statement is graded on a five point Likert scale, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. In Figure 86 we show an example of a questionnaire section, in this case Leadership Readiness. Screenshots of all other sections are shown in Appendix D.

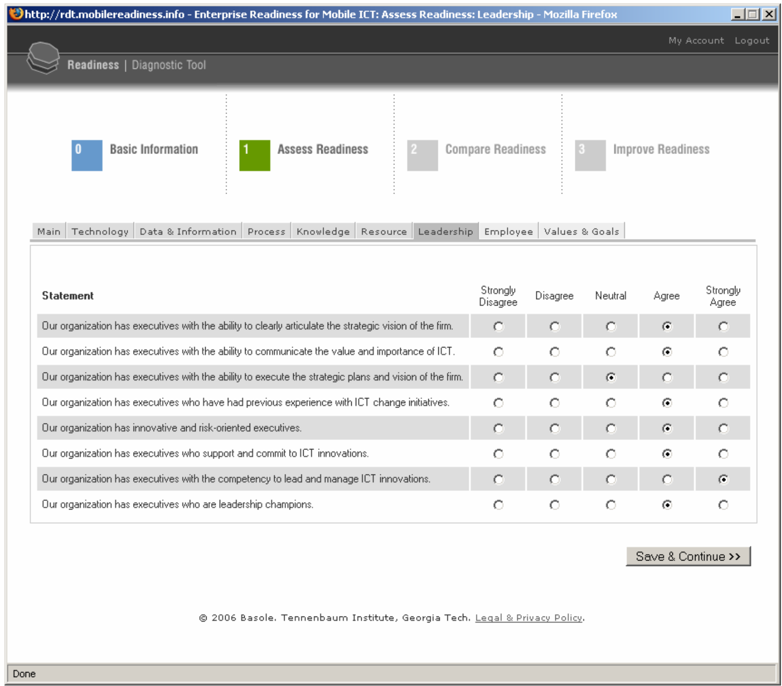


Figure 86. RDT Leadership Readiness Assessment Screen

For each dimension, an average score based on the responses to each assessment indicator for a particular dimension is converted into a dimensional readiness index. The higher the dimensional readiness index the more likely it is that the organization under assessment is ready for mobile ICT along that dimension. Users must complete all statements in order to proceed to the next section.

8.3.3. Compare Readiness Module

After completion of all readiness assessment sections, the user is then taken to the compare readiness module. The compare readiness module includes data in both textual and graphical formats and is divided into the following sections:

- An overall readiness index (100-point scale)
- A readiness index from an academic and practitioner's perspective (100-point scale)
- A readiness index (100-point scale) for each dimension.
- A radar graph indicating the overall enterprise readiness profile with the option of displaying an industry average.

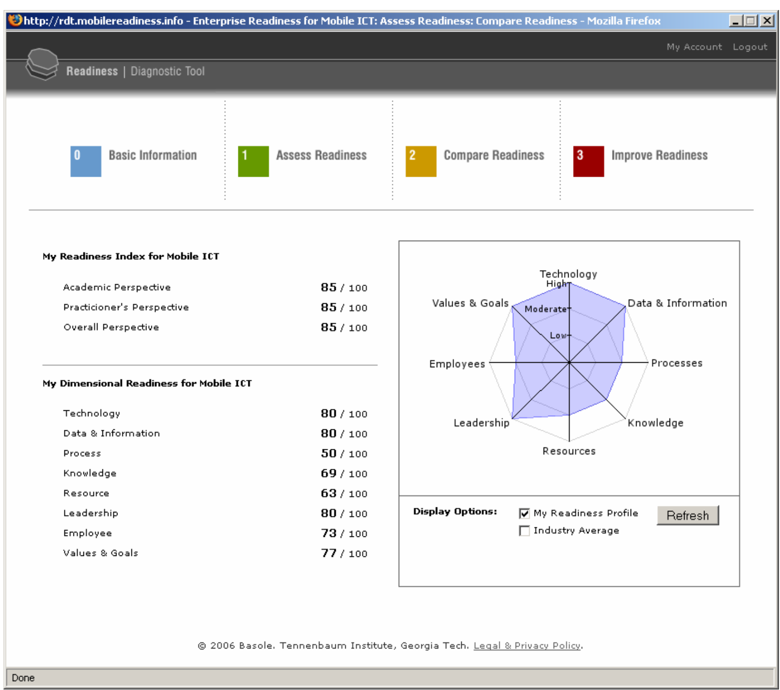


Figure 87. RDT Compare Readiness Summary Screen

The average score for each dimension is used to determine both the dimensional readiness and overall readiness indices. More specifically:

- If the Average Assessment Score of the responses in Readiness Dimension i is greater than 0 but less or equal to 2.33, then the Readiness Level is Low (1)
- If the Average Assessment Score of the responses in Readiness Dimension i is greater than 2.33 but less or equal to 3.67, then the Readiness Level is Moderate (2)
- If the Average Assessment Score of the responses in Readiness Dimension i greater than 3.67 and less than or equal to 5.00, then the Readiness Level is High (3)

The choice of these boundaries is based on simple percentage scores and there is scope for further normalizing the scale once the best-of-breed is established. In order to compute the dimensional readiness index, we utilize the average score and multiply it by 20. This provides us with an index on a 100-point scale. This results in the following equation:

$$\text{ReadinessIndex}_i = \frac{\sum_i \sum_j r_i^j}{n_i} \times 20$$

where i = 1 (Tech), 2 (DataInfo), …., 8 (ValGoals)

$j = 1, 2, 3, \ldots.\ n_i$

n_i = Total Number of Assessment Indicators for Readiness Dimension i

r_i^j = Response to Assessment Indicator j for Readiness Dimension i

In order to compute the overall readiness index from an overall (O), academic (A), and practitioner's (I) perspective, we utilize the following equations:

$$\text{ReadinessIndex(O)} = \frac{\sum_{i=1}^{8} w_i^O \times D_i}{0.03}$$

$$\text{ReadinessIndex(A)} = \frac{\sum_{i=1}^{8} w_i^A \times D_i}{0.03}$$

$$\text{ReadinessIndex(I)} = \frac{\sum_{i=1}^{8} w_i^I \times D_i}{0.03}$$

Table 51. Contribution Weights: Overall, Academic, and Industry Perspective

i	D_i	Overall (w_i^O)	Academics (w_i^A)	Industry (w_i^I)
1	Technology	0.16394	0.186774	0.136298
2	Data & Info	0.128292	0.152089	0.100944
3	Processes	0.100455	0.125349	0.073925
4	Knowledge	0.098738	0.099431	0.09558
5	Resources	0.121966	0.117891	0.122727
6	Leadership	0.270939	0.210731	0.341123
7	Employees	0.084451	0.078737	0.090183
8	Values & Goals	0.016649	0.016659	0.016528

Lastly, we display the readiness profile of the organization under assessment using the average score heuristics used above. The readiness profile provides a visual representation of their overall enterprise readiness for mobile ICT in comparison to an industry average.

If decision makers wish to make changes to their readiness assessment, they can click on the Assess Readiness section and make appropriate changes. When going back to Compare Readiness, updated readiness indices and readiness profile will be automatically displayed.

8.4. System Evaluation

The evaluation of the web-based RDT was based on the functionality of the tool itself, its usability, and its usefulness to its target audience, i.e. executives, senior managers, and ICT decision makers. The reviewers (i.e. evaluators) were given an evaluation questionnaire covering these three areas and were encouraged to provide any additional suggestions for enhancing and general comments on the application.

Three types of methods were used to evaluate the RDT: (1) self-evaluation, (2) peer reviews, and (3) practitioner validation.

- **Self-Evaluation:** The web-based RDT was continually quality tested for any errors or bugs. Any errors in the logic, workflow, and corresponding results were corrected simultaneously with the development of the RDT.
- **Peer Reviews:** A carefully selected panel of researchers and academics with experience in the use of ICT and web-based decision support applications reviewed and evaluated the tool.
- **Practitioner Evaluation:** A random sample of practitioners, drawn from the expert panel set of Phase 2 of our study, evaluated the RDT.

The RDT was evaluated by an independent panel of reviewers including academic researchers and industry practitioners. A total of five academic researchers and six industry practitioners agreed to evaluate the RDT prototype and completed the evaluation forms via e-mail. The evaluation questionnaire draws its areas of assessment from a combination of Davis' Technology Acceptance Model and DeLone and McLean's model of IS success (DeLone & McLean, 1992).

- **Ease of Use.** All reviewers either agreed or strongly agreed that the RDT was easy to use;
- **Ease of Understanding.** All the reviewers either agreed or strongly agreed that the RDT was easy to understand;
- **Ease of Navigation.** A majority of the reviewers strongly agreed that the format of the prototype was easy to navigate; and
- **Design Effectiveness.** All reviewers strongly agreed that the RDT had an appealing visual interface.

8.5. Summary

This chapter described the development and implementation of a web-based readiness diagnostic tool (RDT), provided a brief description of the prototype system, and highlighted the main features. The RDT can be accessed at http://rdt.mobilereadiness.info and enables decision makers to assess the target organization's readiness for mobile ICT in a few simple steps. The RDT is a first prototype towards a full-fledged system. While its basic features and functionalities provide significant insight to enterprise readiness for mobile ICT and a systematic approach to the overall decision space, there are clearly several potential avenues for improvement. A future functionality that could be implemented is to provide tailored readiness improvement strategies for the decision makers' organizational context. Furthermore, industry specific readiness averages could further facilitate and improve the readiness comparison between organizations. Despite its basic features, the RDT provides an excellent way of identifying organizational deficiencies and provide food-for-thought for decision makers planning on adopting and implementing mobile ICT.

CHAPTER 9:

CONCLUSIONS AND FUTURE RESEARCH

9.1. Summary

ICT play a critical role in today's enterprises. With the emergence of new ICT, organizations can significantly improve and transform their operations. However, the decision to adopt and implement emerging ICT is often a difficult one due to a lack of understanding of the potential value, integration with existing technology infrastructures, business processes, and organizational values, cost justifications, and alignment with overall business strategies. It is further complicated through contextual forces, such as competitive pressures, supplier and partner influences, and customer requirements. Organizations often make significant and risky investments in emerging ICT. Without an understanding of the aforementioned factors; these adoptions and implementations have often resulted in unfulfilled expectations and benefits, undesired project outcomes, and in many instances costly failures. In order to minimize the organizational risk associated with adoption of emerging ICT, it is therefore desirable to gain an understanding of the value and impact of the ICT under consideration and be prepared for changes associated with their implementations.

In this dissertation, we set forth to further our understanding of ICT adoption and implementation with a particular focus on the mobile ICT domain. In doing so, we identified critical factors that lead to the adoption of ICT, in general, and mobile ICT in particular. The results of this exploratory study can be found in Chapters 3 and 4.

Our analysis revealed that one particular element of the adoption equation, namely organizational readiness, was greatly understudied. Previous studies limited their examination of organizational readiness on technological and financial resources. Through a more complete review of the literature and a set of expert studies, we found that enterprise readiness for ICT was a much more complex concept. We thus explored enterprise readiness for ICT in further depth and identified key dimensions and associated assessment indicators (see Chapter 5). Through a multi-stage modified expert study approach we validated our conceptual model and determined the relative importance of key dimensions (see Chapters 6 and 7). By performing a sample segment analysis, we were able to extract further information from our model: among many other things, we gained insight to how academics and practitioners, respondents from small and large organizations, and organizations with and without mobile strategies viewed enterprise readiness.

In order to provide some practical use to our empirical results, we then developed a web-based readiness diagnostic tool that provides a systematic view of the mobile ICT readiness assessment space and enables decision makers to self-assess the preparedness of their organization for mobile ICT and identify potential clients that are ready to adopt them (see Chapter 8). The results of the web-based readiness diagnostic tool provide decision makers with both textual and graphical insight to enterprise readiness and deficiencies as well as a basis for mobile ICT investment justifications.

9.2. Contributions

This study is a valuable and useful resource for both researchers and practitioners concerned with the adoption of emerging ICT, in general, and mobile ICT, in particular, and contributes in several important ways. Table 52 presents a summary of these contributions and we discuss them briefly in turn.

Table 52. Summary of Contributions to Theory and Practice

Contribution Type	Contribution
Theory	1. Synthesis of ICT Adoption and Implementation Literature 2. Development of an Integrative ICT Adoption Model 3. Development of an Enterprise Readiness Model 4. Development of a Mobile Transformation Framework
Practice	1. Applying Enterprise Readiness Model to the Mobile ICT domain 2. Development of a Web-Based Readiness Diagnostic Tool (RDT)

The theoretical contributions of this dissertation are multifold. First, this dissertation provides a comprehensive synthesis of the ICT adoption and implementation literature and develops an integrative ICT adoption model. Second, motivated by Rouse's Theory of Enterprise Transformation (Rouse, 2005b), we develop a multi-phase mobile transformation framework and identify a theoretical element that had received limited attention in the adoption literature, namely enterprise readiness for ICT. We explored and developed the novel concept of enterprise readiness for ICT in significant depth by identifying and validating its key dimensions and associated assessment indicators. In doing so, we not only furthered our understanding of the factors that drive ICT adoption and implementation, but also provided an initial step for subsequent theoretical research in ICT management and strategy, specifically, and enterprise transformation, in general.

As an extension to our general conceptual model of enterprise readiness, we then investigated its applicability in one particular domain – mobile ICT. This has two benefits. First, it validated the applicability of previous adoption and implementation research to this emerging context. Second, it provided the research community with a theoretical model that explains enterprise adoption of and transformation via mobile ICT.

This dissertation also has significant practical implications. Using the results obtained from our empirical analysis, we developed a web-based readiness diagnostic tool that provides a systematic view of the mobile ICT readiness assessment space and enables decision makers to self-assess the preparedness of their organization for mobile ICT and identify potential clients that are ready to adopt them. The results of the web-based readiness diagnostic tool provide decision makers with both textual and graphical insight to enterprise readiness and deficiencies as well as a basis for mobile ICT investment justifications. The readiness tool not only provides a means for self-assessment, but also an assessment of potential customers that can be targeted for mobile ICT adoption.

9.3. Limitations of the Study and Future Research

Like all research, this dissertation could be improved and extended. One drawback of a multi-disciplinary study is the possibility of leaving out certain models, theories, and approaches from certain domains. The goal of this dissertation was not to develop an integrative one-for-all adoption theory, but draw from the aforementioned fields and provide a complimentary view on ICT adoption and implementation research. As such, our model should be viewed as a high-level, but comprehensive, approach to ICT adoption. In the broad scope of our research efforts, a potential research opportunity is to empirically validate our mobile transformation framework and perform detailed case studies.

In this dissertation, we focused our efforts on one particular element, enterprise readiness. However, to provide a complete understanding of the ICT adoption decision, the other decision elements must also be integrated into an analytical model. One potential future research opportunity is thus to empirically validate the relevance and importance of business value of ICT, cost and economics, risk and uncertainty, and strategy in the overall adoption decision.

Respondents to our study of enterprise readiness were primarily executives and senior managers. It would be beneficial, and potentially insightful, to evaluate how respondents from other levels in organizations would assess the relevance and importance of the readiness dimensions and assessment indicators. A future research study would thus include the examination of multi-level views of enterprise readiness.

The examples of enterprise transformations via mobile ICT presented in Chapter 2 provided an initial perspective to what extent mobile solutions have been adopted and what impact they have had on enterprises. However, how much readiness is needed to achieve these types of mobility has not been examined. Using our enterprise readiness framework and proposed assessment indicators, another future research area will focus on investigating this issue in further detail. In particular, we are hoping to determine threshold levels of enterprise readiness necessary to pursue mobile ICT adoption for each phase.

Lastly, our study has exclusively focused on the mobile ICT domain. However, the enterprise readiness model could be easily extended to other types of ICT. For example, we could examine enterprise readiness for other enterprise ICT, such as ERP, CRM, or SFA, or one particular mobile ICT, such as RFID. Another future research direction would be to apply the enterprise readiness framework to supply chain or transformation readiness.

APPENDIX A:

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APPENDIX B:

WEB-BASED EXPERT STUDY

Phase 1 Screenshots

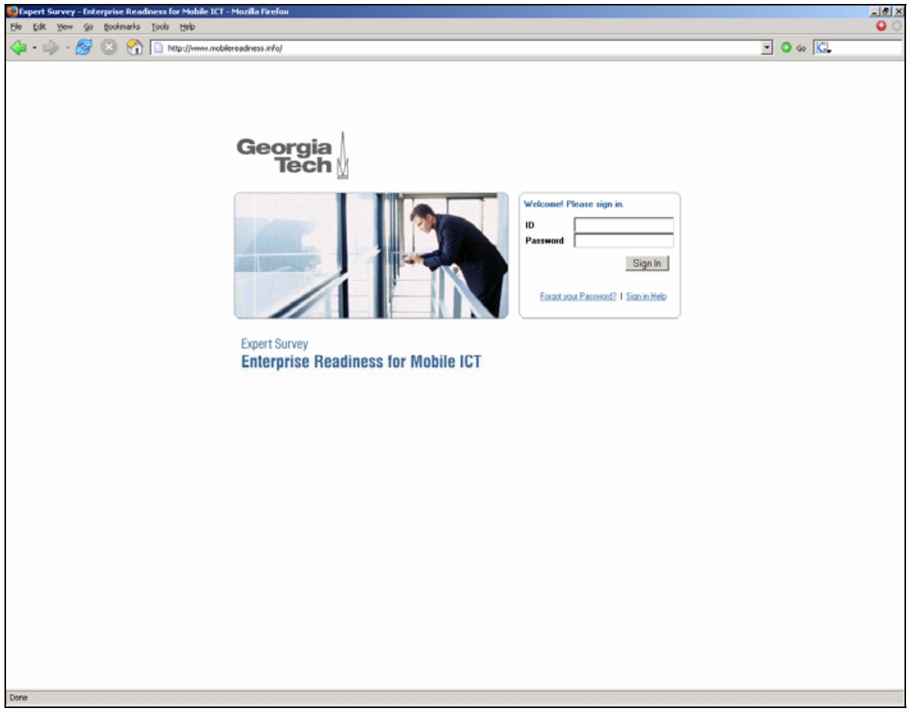

Figure 88. Phase 1 Login Screen

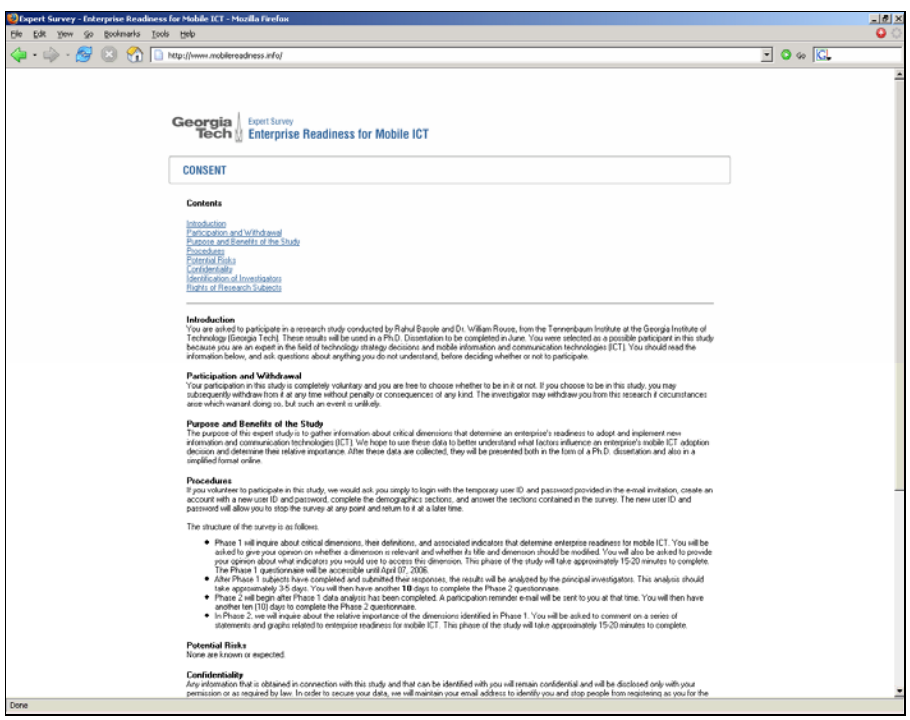

Figure 89. Phase 1 Consent Screen

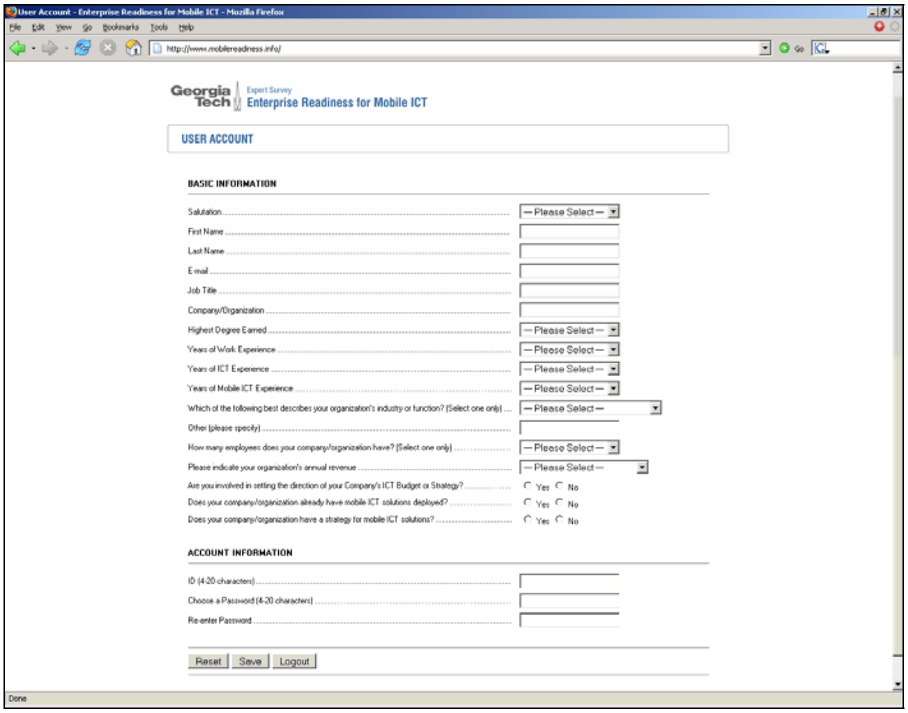

Figure 90. Phase 1 User Account Screen

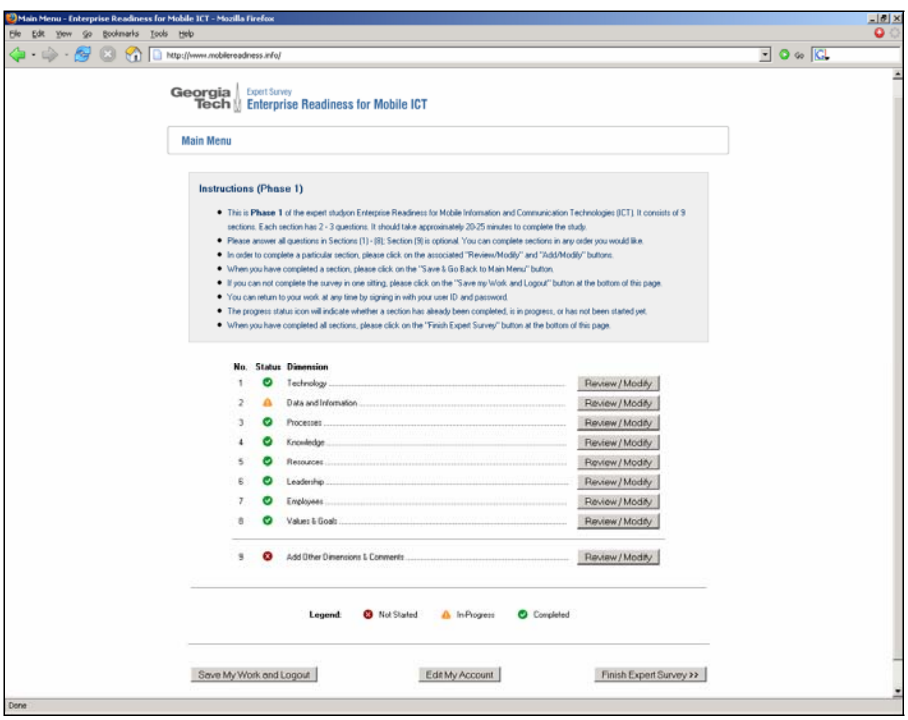

Figure 91. Phase 1 Main Menu

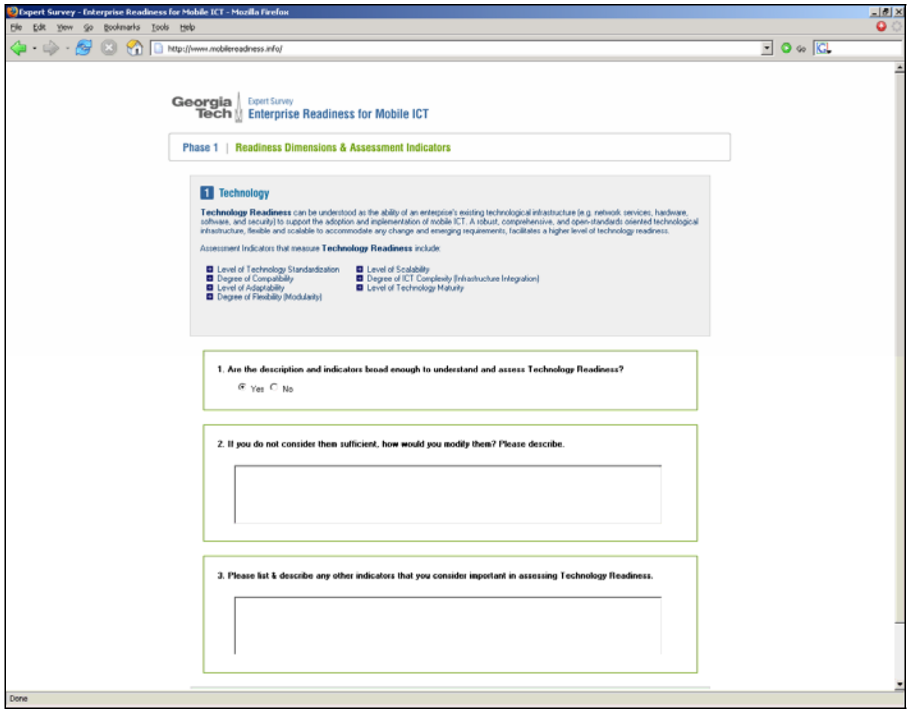

Figure 92. Technology Readiness and Assessment Indicators (Phase 1)

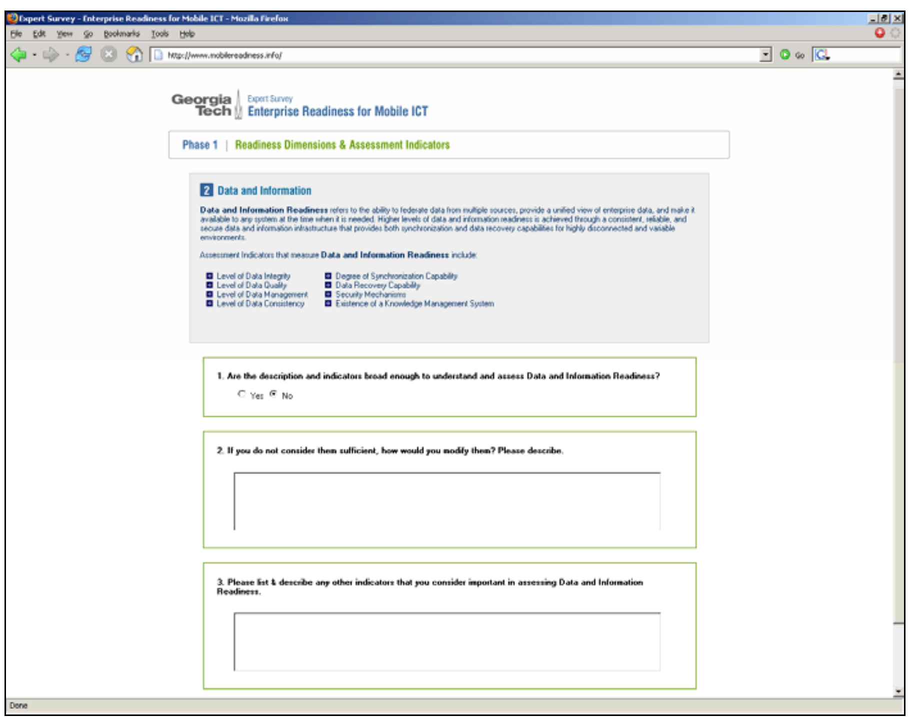

Figure 93. Data & Information Readiness and Assessment Indicators (Phase 1)

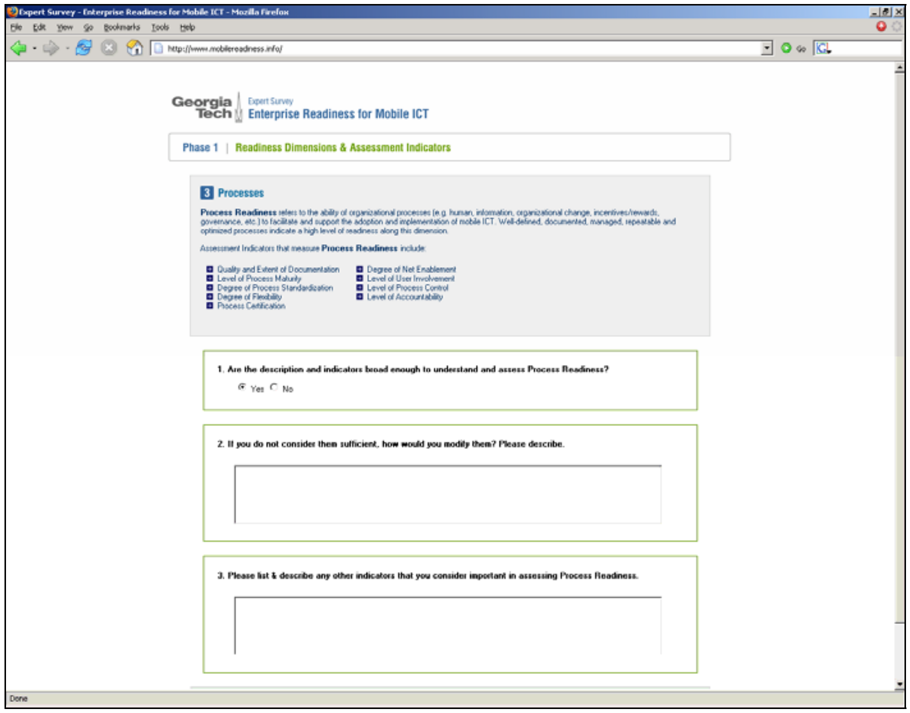

Figure 94. Process Readiness and Assessment Indicators (Phase 1)

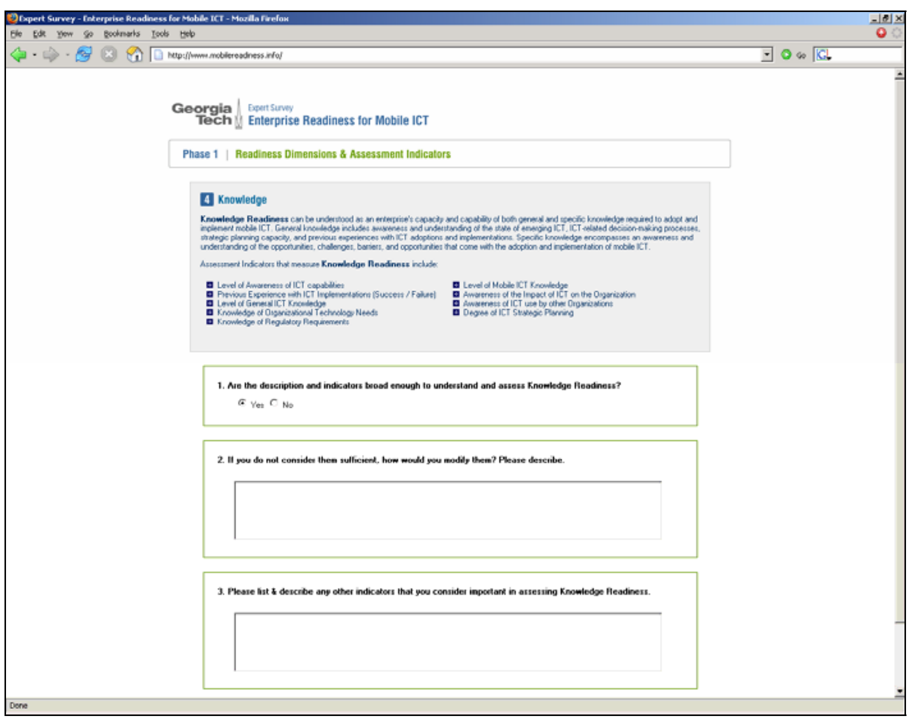

Figure 95. Knowledge Readiness and Assessment Indicators (Phase 1)

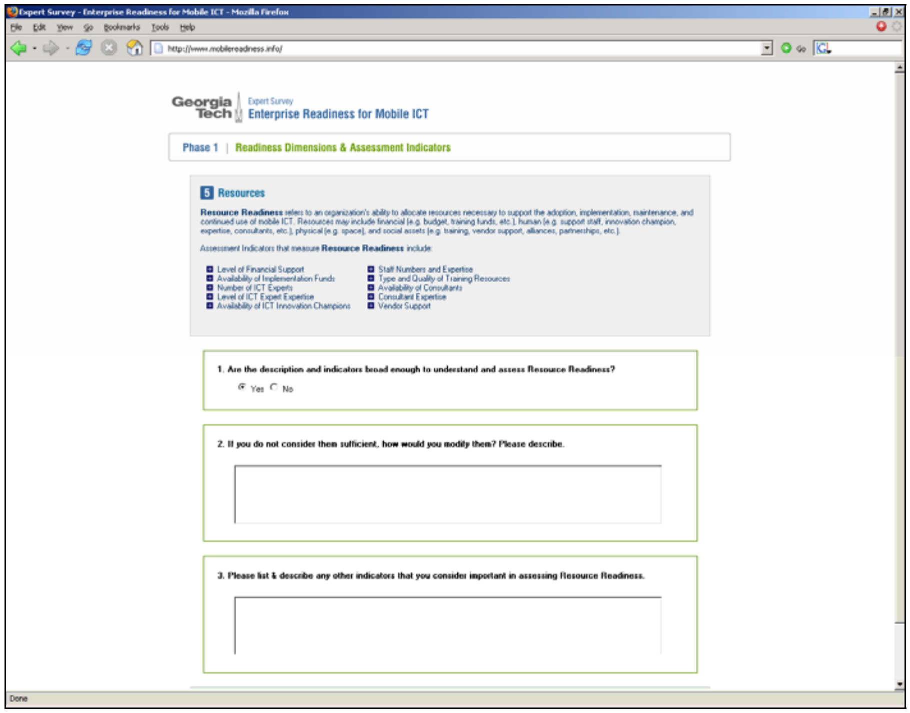

Figure 96. Resource Readiness and Assessment Indicators (Phase 1)

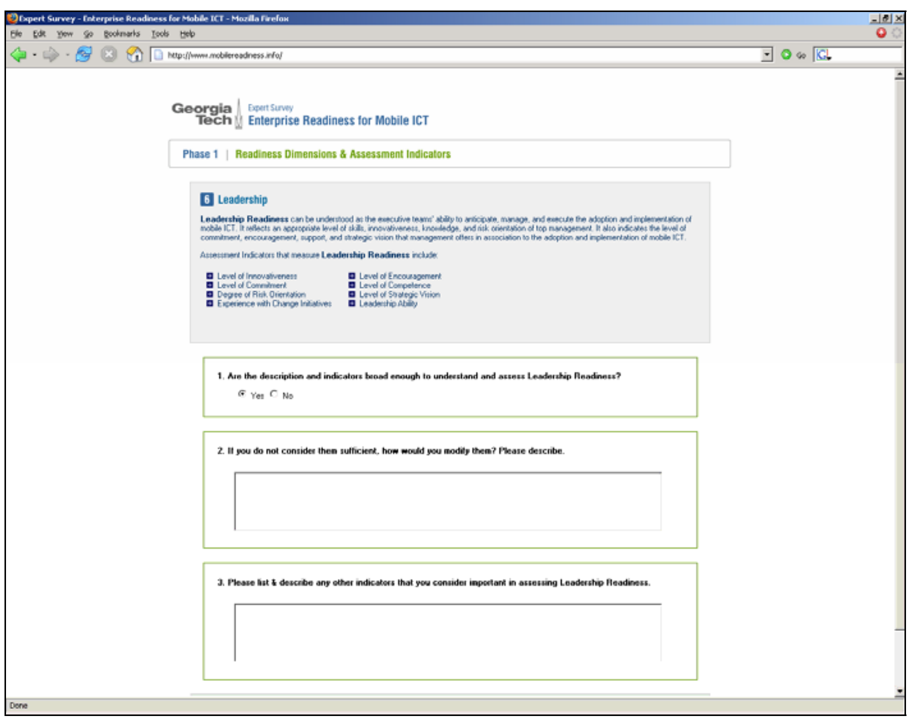

Figure 97. Leadership Readiness and Assessment Indicators (Phase 1)

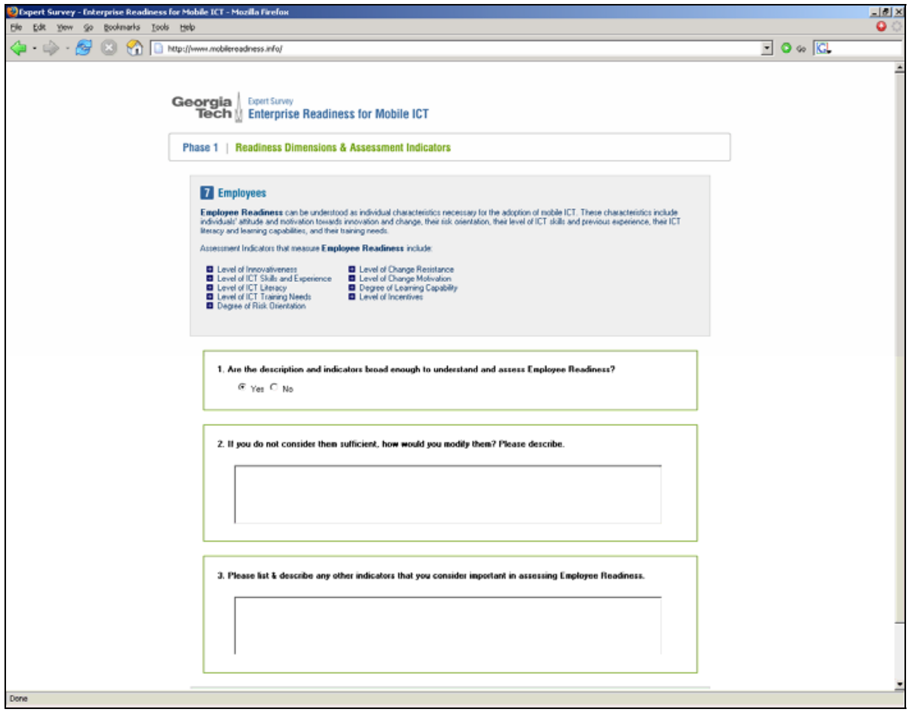

Figure 98. Employee Readiness and Assessment Indicators (Phase 1)

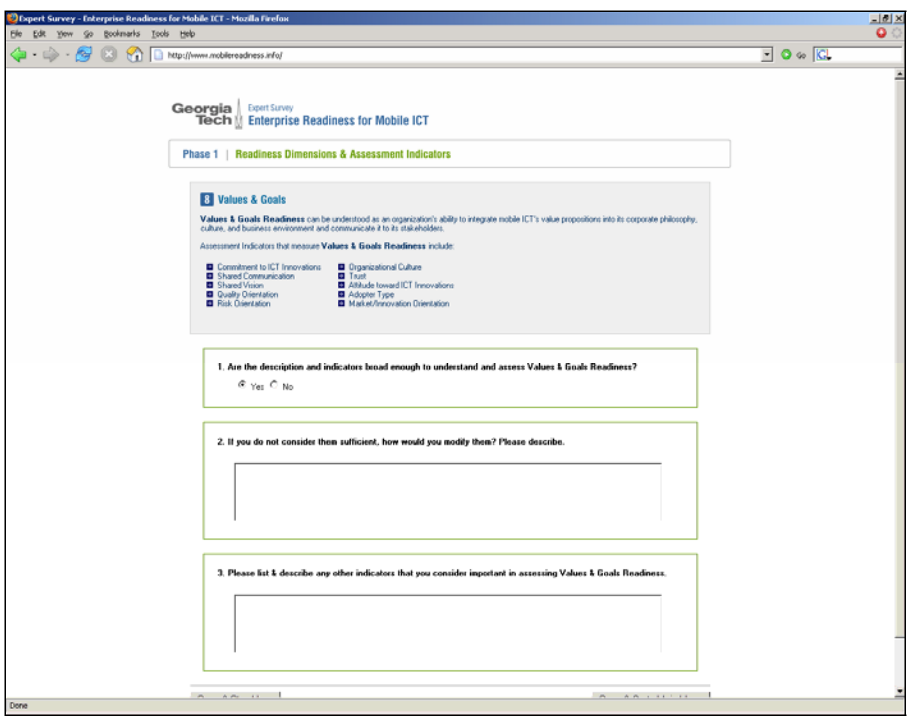

Figure 99. Values & Goals Readiness and Assessment Indicators (Phase 1)

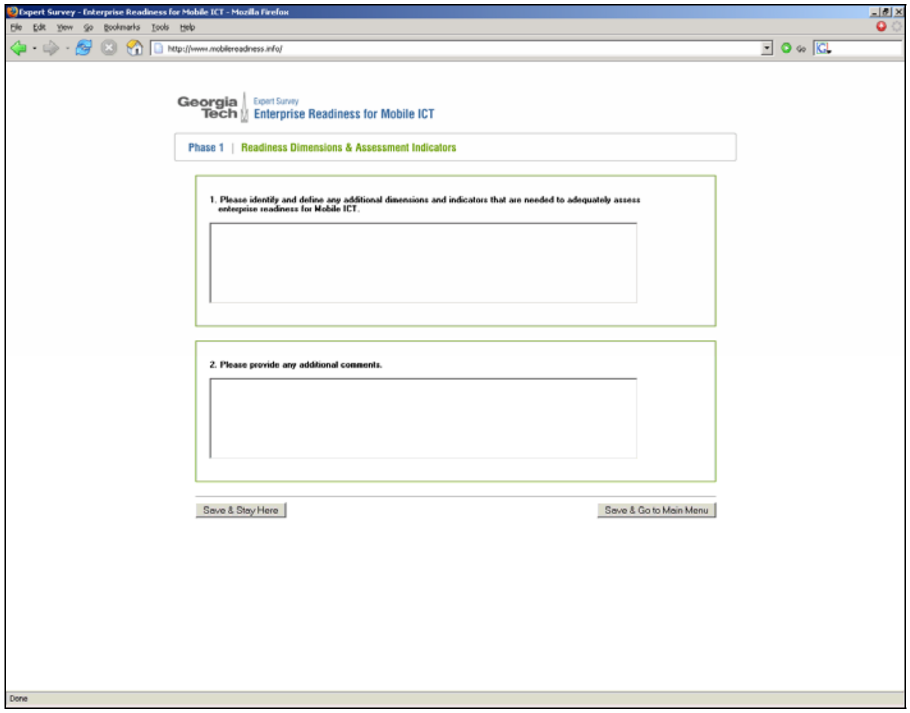

Figure 100. Additional Dimensions and Comments (Phase 1)

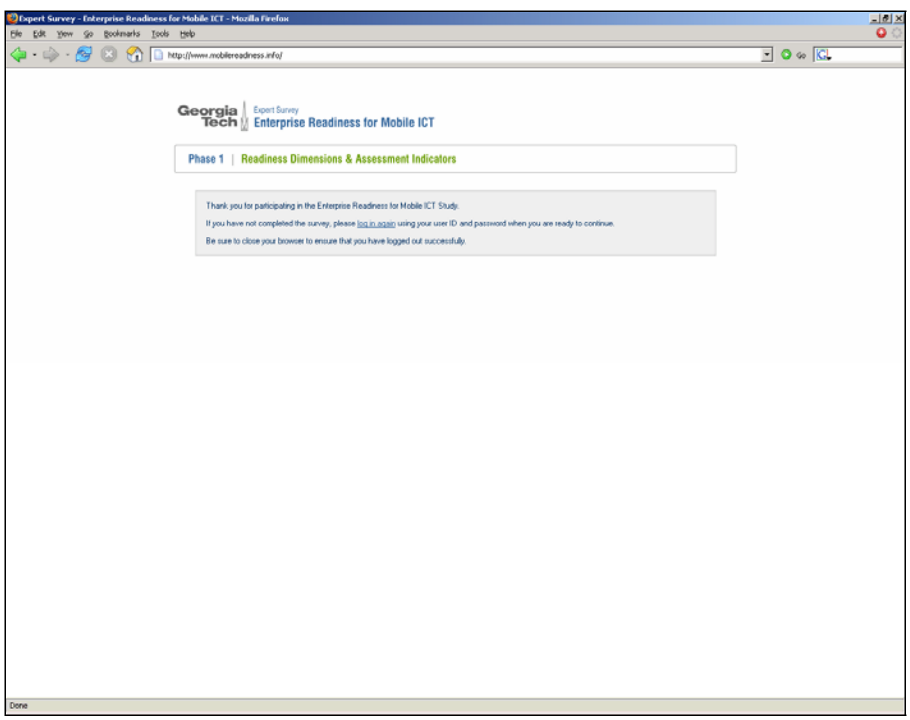

Figure 101. Thank you and Logout Screen (Phase 1)

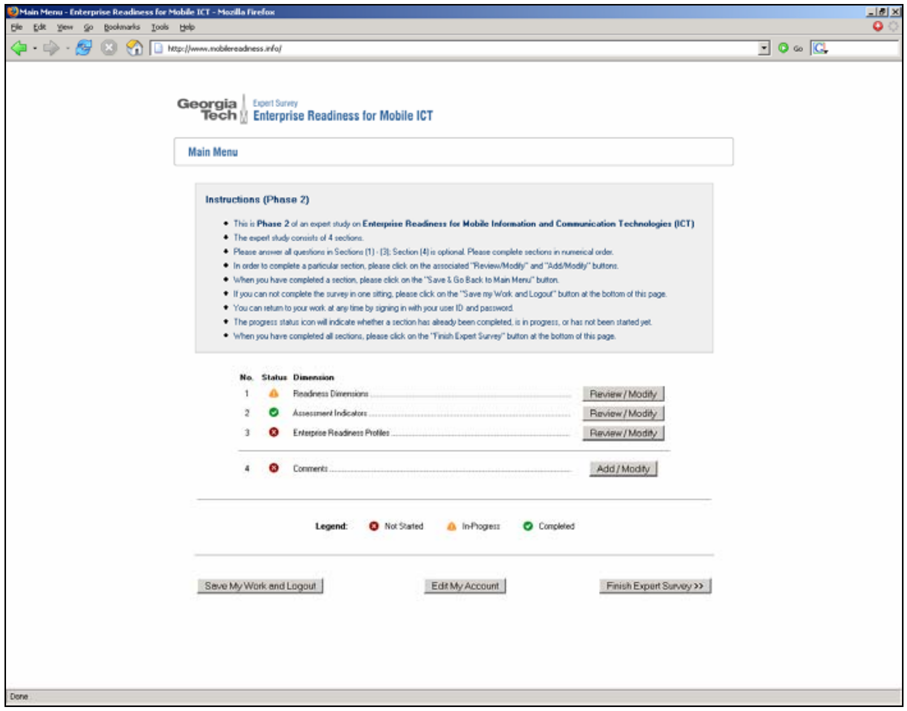

Figure 102. Phase 2 Main Page

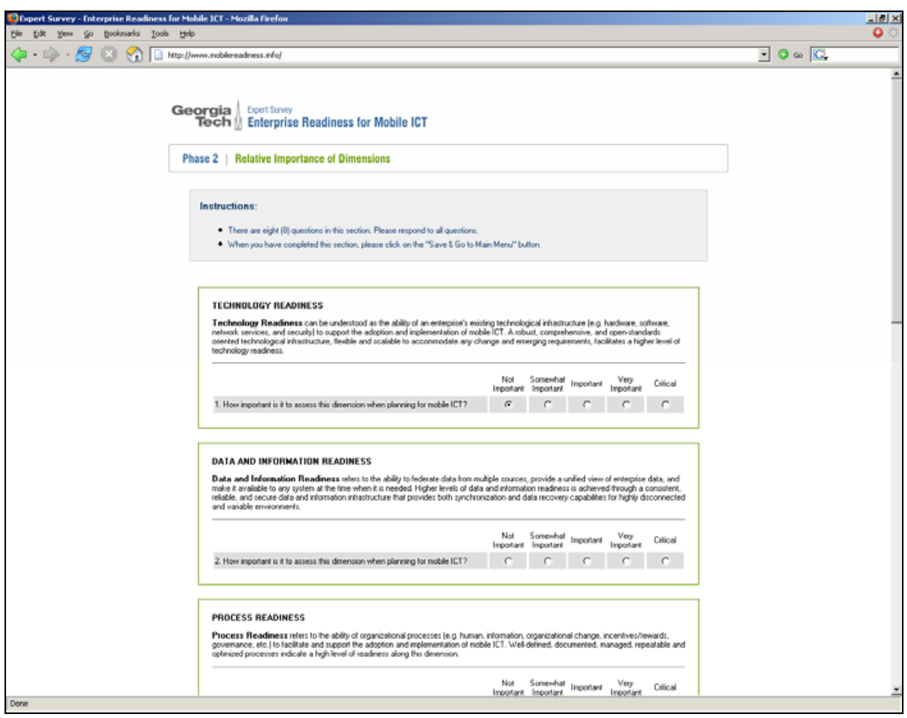

Figure 103. Phase 2 Section 1

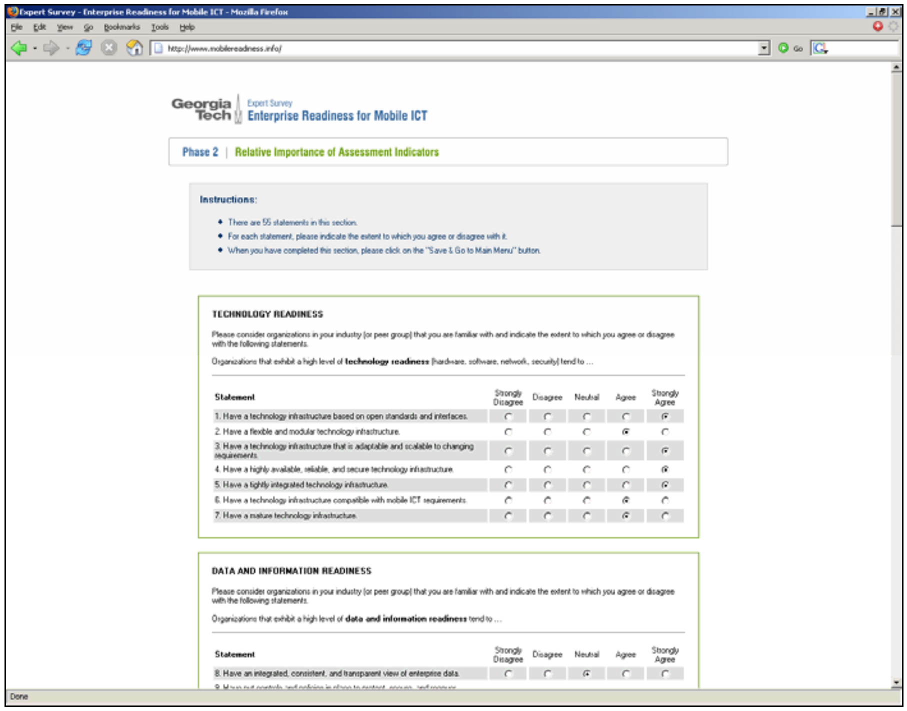

Figure 104. Phase 2 Section 2

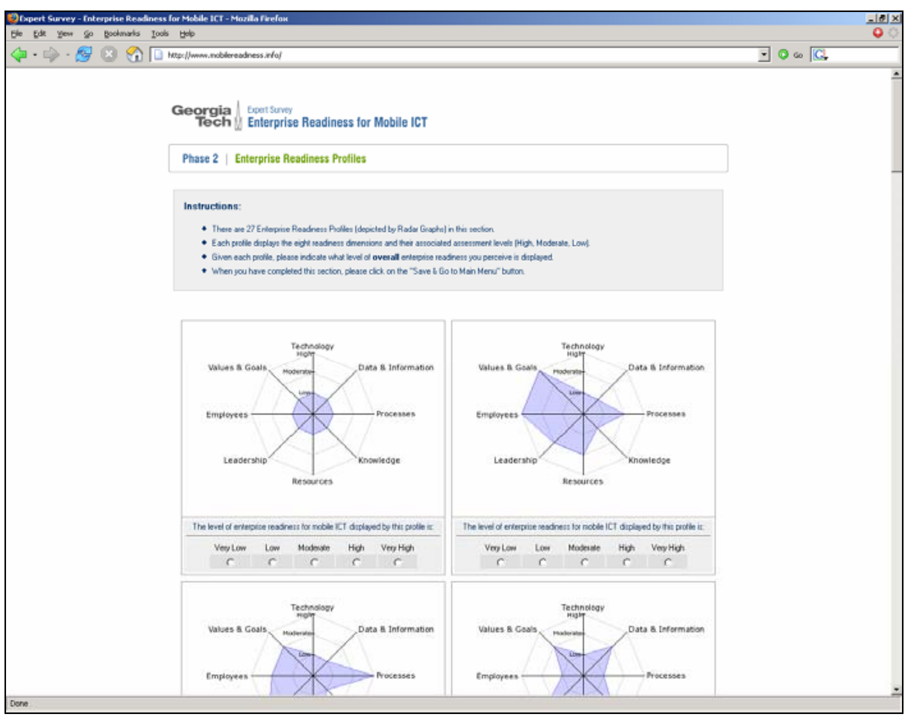

Figure 105. Phase 2 Section 3

Expert Survey Instrument (Phase 1)

Section 1

Technology Readiness can be understood as the ability of an enterprise's existing technological infrastructure (e.g. hardware, software, network services, and security) to support the adoption and implementation of mobile ICT. A robust, comprehensive, and open-standards oriented technological infrastructure, flexible and scalable to accommodate any change and emerging requirements, facilitates a higher level of technology readiness.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Data and Information Readiness refers to the ability to federate data from multiple sources, provide a unified view of enterprise data, and make it available to any system at the time when it is needed. Higher levels of data and information readiness is achieved through a consistent, reliable, and secure data and information infrastructure that provides both synchronization and data recovery capabilities for highly disconnected and variable environments.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Process Readiness refers to the ability of organizational processes (e.g. human, information, organizational change, incentives/rewards, governance, etc.) to facilitate and support the adoption and implementation of mobile ICT. Well-defined, documented, managed, repeatable and optimized processes indicate a high level of readiness along this dimension.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Knowledge Readiness can be understood as an enterprise's capacity and capability of both general and specific knowledge required to adopt and implement mobile ICT. General knowledge includes awareness and understanding of the state of emerging ICT, regulatory requirements, ICT-related decision-making processes, strategic planning capacity, and previous experiences with ICT adoptions and implementations. Specific knowledge encompasses an awareness and understanding of the opportunities, challenges, barriers, and opportunities that come with the adoption and implementation of mobile ICT.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Resource Readiness refers to an organization's ability to allocate resources necessary to support the adoption, implementation, maintenance, and continued use of mobile ICT. Resources may include financial (e.g. budget, training funds, etc.), human (e.g. support staff, innovation champion, expertise, consultants, etc.), and social assets (e.g. training, vendor support, alliances, partnerships, etc.).

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Leadership Readiness can be understood as the executive teams' ability to anticipate, manage, and execute the adoption and implementation of mobile ICT. It reflects an appropriate level of skills, innovativeness, knowledge, and risk orientation of top management. It also indicates the level of commitment, encouragement, support, and strategic vision that management offers in association to the adoption and implementation of mobile ICT.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Employee Readiness can be understood as individual characteristics necessary for the successful adoption of mobile ICT. These characteristics include individuals' attitude and motivation towards innovation and change, their risk orientation, their level of ICT skills and previous experience, and their ICT literacy and learning capabilities.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Values & Goals Readiness can be understood as an organization's ability to integrate mobile ICT's value propositions into its corporate philosophy, culture, and business environment and communicate it to its stakeholders.

How important is it to assess this dimension when planning for mobile ICT?
(1=Not Important, 2=Somewhat Important, 3=Important, 4=Very Important, 5=Critical)

Section 2

Technology Readiness

Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Technology Readiness (hardware, software, network, security) tend to …

1. Have a technology infrastructure based on open standards and interfaces.

2. Have a flexible and modular technology infrastructure.
3. Have a technology infrastructure that is adaptable and scalable to changing requirements.
4. Have a highly available, reliable, and secure technology infrastructure.
5. Have a tightly integrated technology infrastructure.
6. Have a technology infrastructure compatible with mobile ICT requirements.
7. Have a mature technology infrastructure.

Data and Information Readiness
Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Data and Information Readiness tend to …

8. Have an integrated, consistent, and transparent view of enterprise data.
9. Have put controls and policies in place to protect, secure, and recover enterprise data.
10. Have established mature standards and policies for enterprise data.
11. Ensure that required data and information is available in a timely and effective manner.
12. Have the ability to synchronize enterprise data effectively in both connected and disconnected environments.

Process Readiness
Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Process Readiness tend to …

13. Have standardized and mature business processes.
14. Have adaptive business processes.
15. Have a high degree of net-enabled business processes.
16. Have organizational policies and strategies for business processes in place.
17. Have formalized governance, decision-making, and resource-related processes in place.
18. Have a high quality and extent of documentation.

Knowledge Readiness
Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Knowledge Readiness tend to …

19. Have an understanding of organizational ICT needs.
20. Have an understanding of regulatory requirements.
21. Be aware of the value and impact of ICT on the organization.
22. Be aware of ICT use by other organizations.
23. Have previous experience with ICT implementations.
24. Be aware of the capabilities provided by ICT.
25. Have a formalized knowledge management system in place.
26. Encourage continuing education and knowledge advancement by its members.
27. Have ICT diffused throughout the entire organization.

Resource Readiness
Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Resource Readiness tend to …

28. Provide sufficient financial support for ICT implementation.
29. Have an IT staff capable of managing the adoption and implementation of ICT.
30. Have sufficient number of ICT experts in the organization.
31. Have sufficient consultant expertise readily available.
32. Receive sufficient vendor support.
33. Have ICT innovation champions in the organization.
34. Make extensive and high quality training resources available to its members.

Leadership Readiness
Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Leadership Readiness tend to …

35. Have executives with the ability to clearly articulate the strategic vision of the firm.
36. Have executives with the ability to communicate the value and importance of ICT.
37. Have executives with the ability to execute the strategic plans and vision of the firm.
38. Have executives who have had previous experience with ICT change initiatives.
39. Have innovative and risk-oriented executives.
40. Have executives who support and commit to ICT innovations.
41. Have executives with the competency to lead and manage ICT innovations.
42. Have executives who are leadership champions.

Employee Readiness

Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Employee Readiness tend to …

43. Have employees that are innovative and risk-oriented.
44. Have employees with a low resistance to change.
45. Have employees that are motivated to use mobile ICT.
46. Have employees with a positive attitude towards mobile ICT.
47. Have employees with significant ICT skills and experience.
48. Have employees with high degree of learning capabilities.

Values and Goals Readiness

Please consider organizations in your industry (or peer group) that you are familiar with and indicate the extent to which you agree or disagree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

Organizations that exhibit a high level of Values and Goals Readiness tend to …

49. Have an organizational environment that embraces and encourages ICT innovation.
50. Have an organizational culture that is risk-oriented.
51. Have an organizational culture that embraces top-down, bottom-up, and lateral communication.
52. Have an organizational climate characterized by mutual trust among its members.
53. Have a shared and communicated strategic vision of ICT innovation.
54. Have an organizational environment that values quality.
55. Have an organizational culture that aligns rewards and incentives with ICT innovation.

Consent Form

Georgia Institute of Technology
Tennenbaum Institute
School of Industrial and Systems Engineering
Atlanta, GA 30332
USA

Contents

1. Introduction

You are asked to participate in a research study conducted by Rahul Basole and Dr. William Rouse, from the Tennenbaum Institute at the Georgia Institute of Technology (Georgia Tech). These results will be used in a Ph.D. Dissertation to be completed in June. You were selected as a possible participant in this study because you are an expert in the field of technology strategy decisions and mobile ICT. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

2. Participation and Withdrawal

Your participation in this study is completely voluntary and you are free to choose whether to be in it or not. If you choose to be in this study, you may subsequently withdraw from it at any time without penalty or consequences of any kind. The investigator may withdraw you from this research if circumstances arise which warrant doing so, but such an event is unlikely.

3. Purpose and Benefits of the Study

The purpose of this expert study is to gather information about critical dimensions that determine an enterprise's readiness to adopt and implement new information and communication technologies (ICT). We hope to use these data to better understand what factors influence an enterprise's mobile ICT adoption decision and determine their relative importance. After these data are collected, they will be presented both in the form of a Ph.D. dissertation and also in a simplified format online.

4. Procedures

If you volunteer to participate in this study, we would ask you simply to login with the temporary user ID and password provided in the e-mail invitation, create an account with a new user ID and password, complete the demographics sections, and answer the sections contained in the survey. The new user ID and password will allow you to stop the survey at any point and return to it at a later time.

The structure of the survey is as follows.

- Phase 1 will inquire about critical dimensions, their definitions, and associated indicators that determine enterprise readiness for mobile ICT. You will be asked to give your opinion on whether a dimension is relevant and whether its title and dimension should be modified. You will also be asked to provide your opinion about what indicators you would use to assess this dimension. This phase of the study will take approximately 15-20 minutes to complete. The Phase 1 questionnaire will be accessible until [xx/xx/xxxx]

- After Phase 1 subjects have completed and submitted their responses, the results will be analyzed by the principal investigators. This analysis should take approximately 7-10 days

- Phase 2 will begin after Phase 1 data analysis has been completed. A participation reminder e-mail will be sent to you at that time. You will then have another [xx] days to complete the Phase 2 questionnaire.

- In Phase 2, we will inquire about the relative importance of the dimensions identified in Phase 1. You will be asked to comment on a series of statements and graphs related to enterprise readiness for mobile ICT. This phase of the study will take approximately 15-20 minutes to complete.

5. Potential Risks
None are known or expected.

6. Confidentiality
Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.
In order to secure your data, we will maintain your email address to identify you and stop people from registering as you for the duration of the study. When the study has been completed, all such identifying information will be destroyed, and none of your responses will be in any way traceable back to you.

7. Identification of Investigators
If you have any questions or concerns about the research, please feel free to contact:

Rahul C. Basole (Co-Investigator)
755 Ferst Drive
Atlanta, GA 30306
404-385-6269
rbasole AT ti DOT gatech DOT edu

Dr. William B. Rouse (Principal Investigator & Faculty Sponsor)
755 Ferst Drive
Atlanta, GA 30306
404-894-2301
bill.rouse AT ti DOT gatech DOT edu

8. Rights of Research Subjects

You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you feel you have been treated unfairly, or you have questions regarding your rights as a research subject, you may contact the Office of Research Compliance, Georgia Tech, Research Administration Building, 505 Tenth Street, NW, Atlanta, Georgia 30332, 404-894-6944.

Please click on the “Start Survey” button to begin the survey.

APPENDIX C:

ENTERPRISE READINESS PROFILES

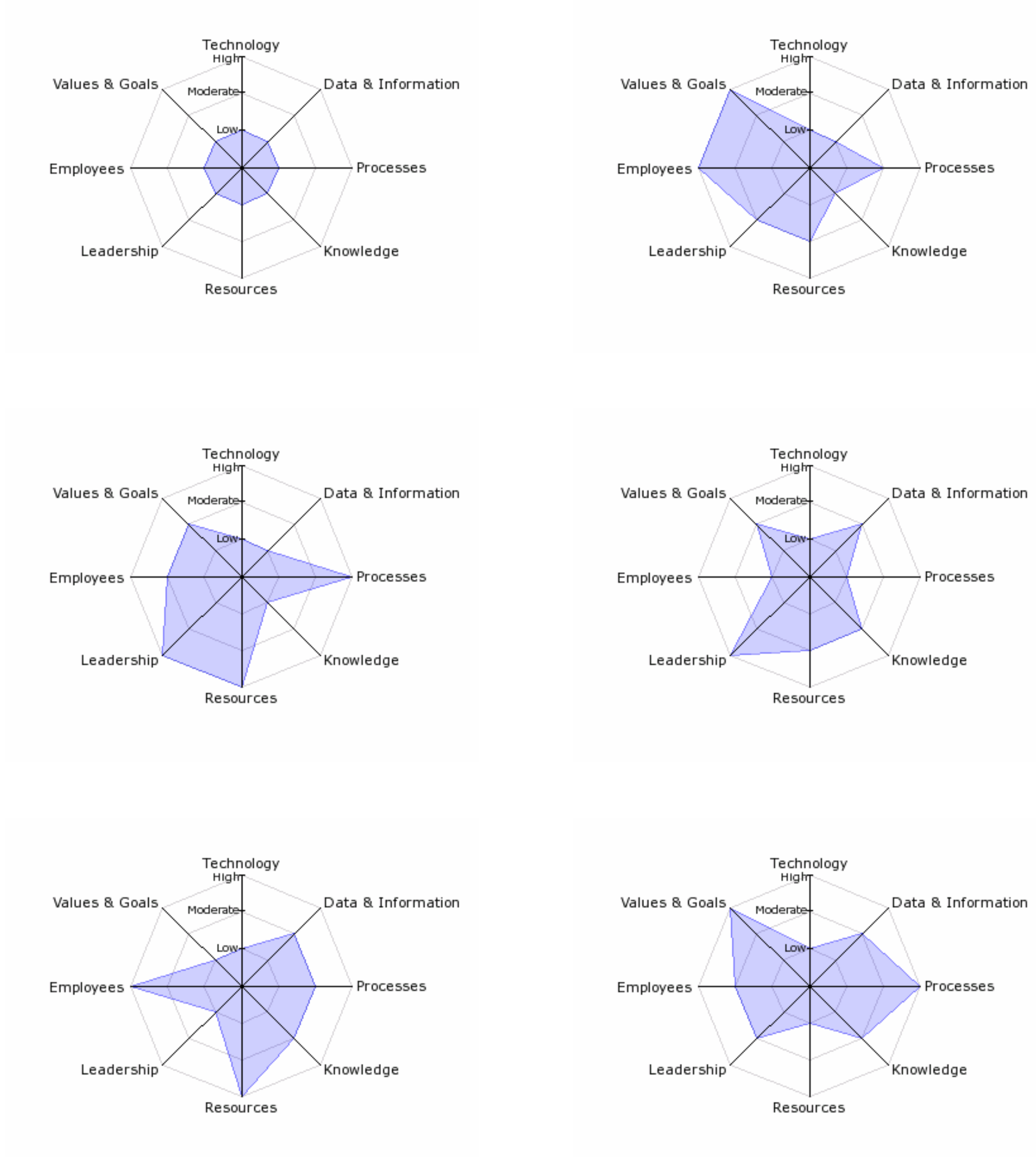

Figure 106. Enterprise Readiness Profile (1-6)

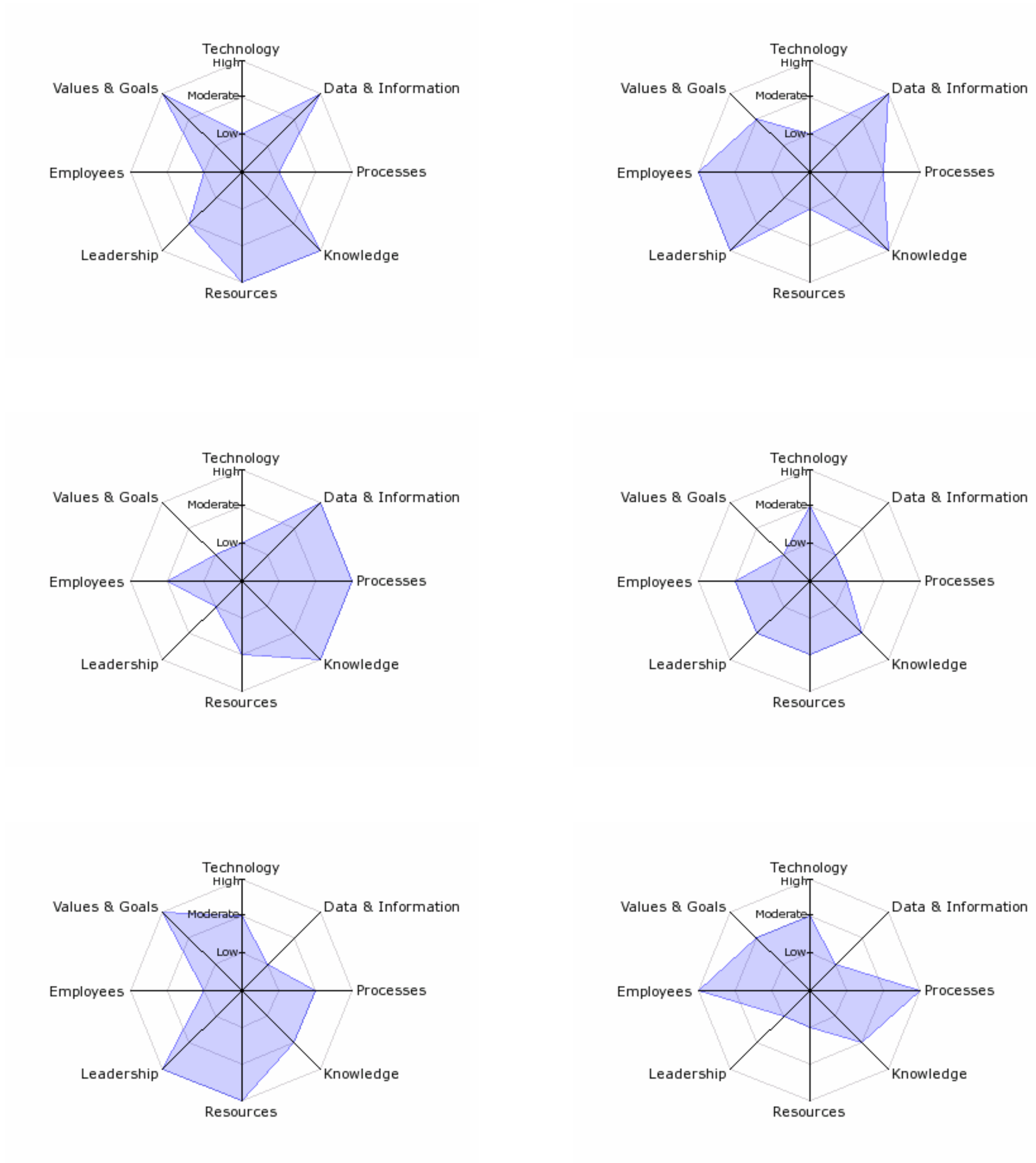

Figure 107. Enterprise Readiness Profile (7-12)

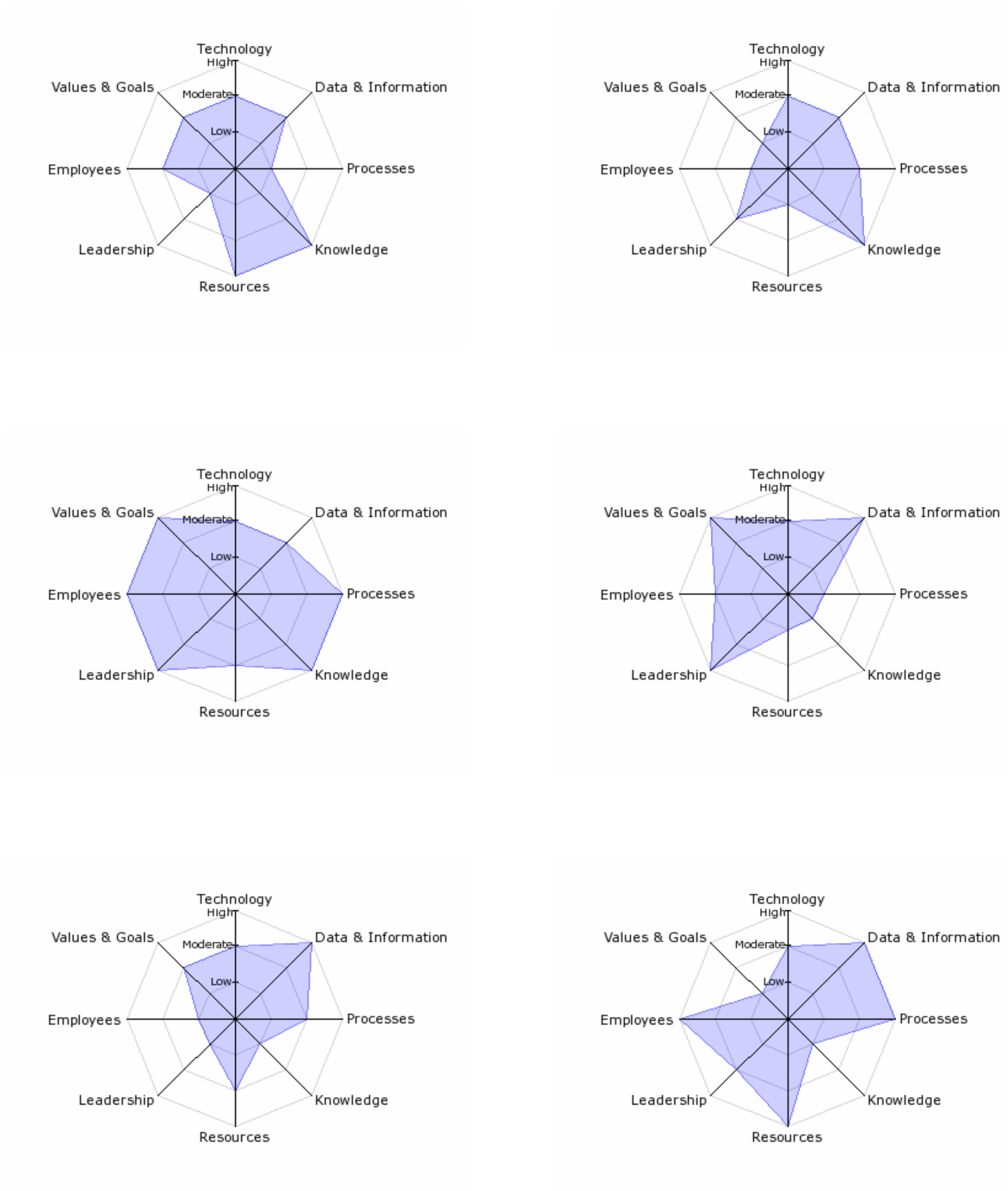

Figure 108. Enterprise Readiness Profile (13-18)

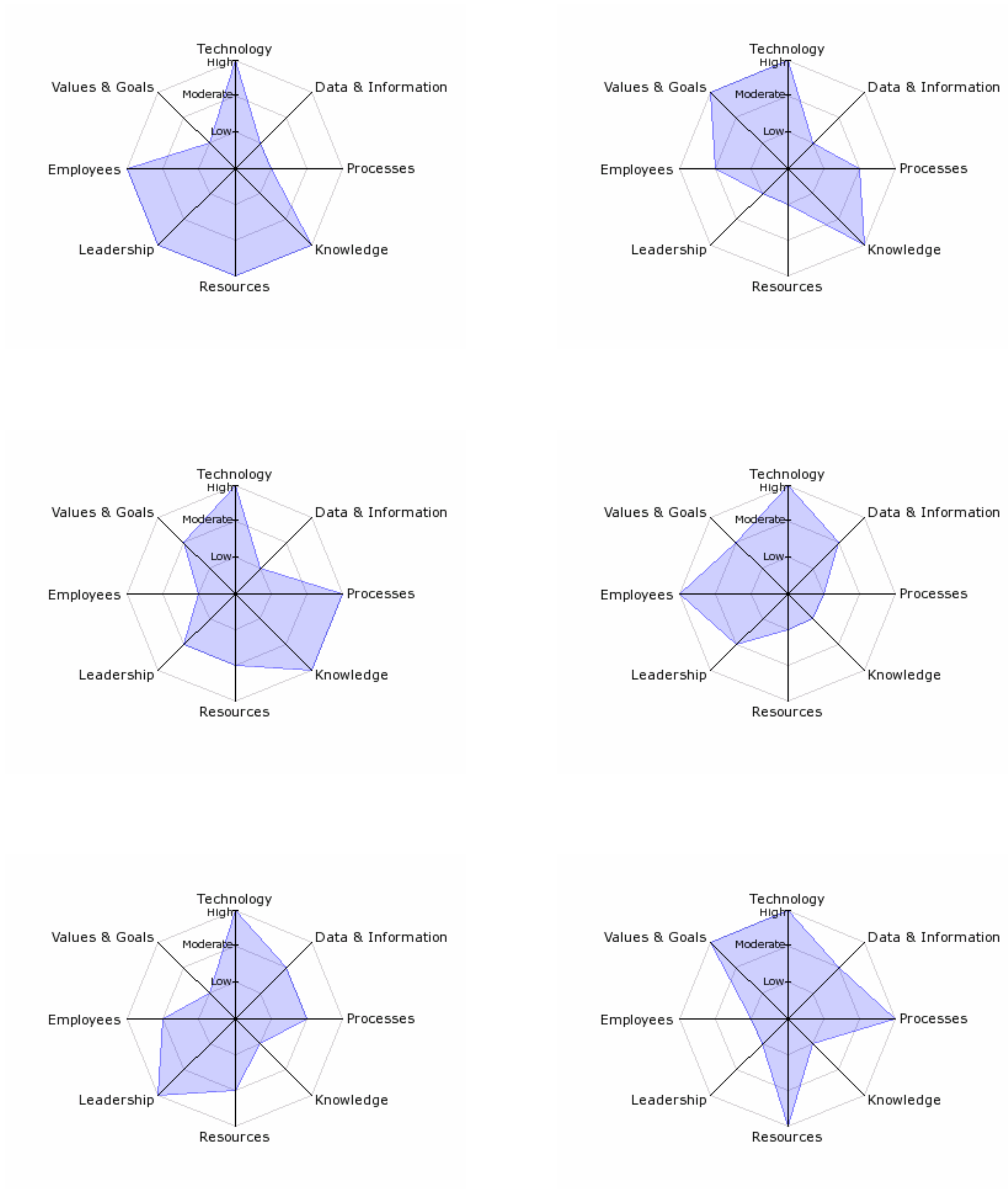

Figure 109. Enterprise Readiness Profile (19-24)

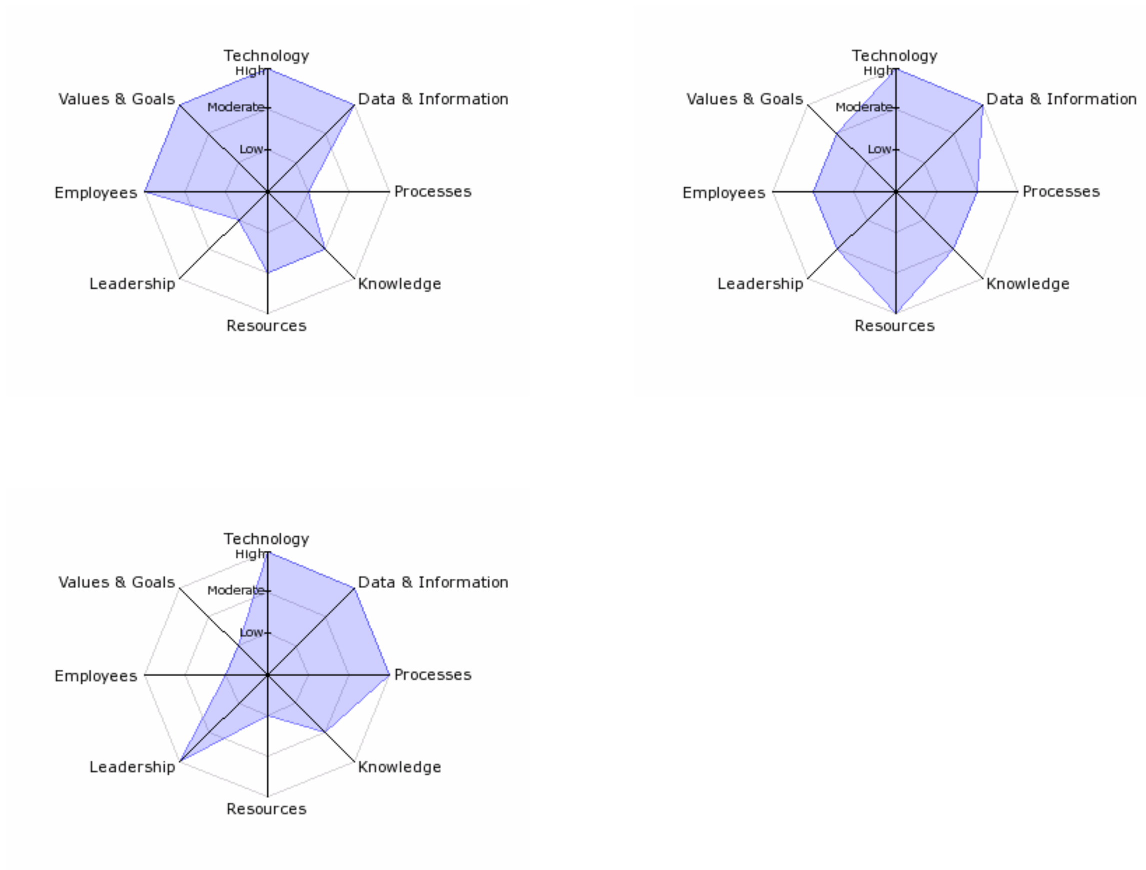

Figure 110. Enterprise Readiness Profile (25-27)

APPENDIX D:

STATISTICAL AND COMPUTATIONAL RESULTS

Table 53. Descriptive Statistics, Technology Indicators (Academics)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	58	58	58	58	58	58	58
Missing	0	0	0	0	0	0	0
Mean	3.500	3.828	4.207	3.879	3.207	3.707	3.259
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.843	0.625	0.695	0.796	0.744	0.859	0.870
Variance	0.711	0.391	0.483	0.634	0.553	0.737	0.757
Minimum	1	2	2	2	2	2	1
Maximum	5	5	5	5	4	5	5

Table 54. Descriptive Statistics, Technology Indicators (Industry)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	51	51	51	51	51	51	51
Missing	0	0	0	0	0	0	0
Mean	3.863	4.059	4.216	4.216	3.333	3.863	3.412
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.939	0.506	0.702	0.832	1.033	0.800	0.853
Variance	0.881	0.256	0.493	0.693	1.067	0.641	0.727
Minimum	1	3	2	2	1	2	2
Maximum	5	5	5	5	5	5	5

Table 55. Descriptive Statistics, Technology Indicators (US Organizations)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	61	61	61	61	61	61	61
Missing	0	0	0	0	0	0	0
Mean	3.902	3.984	4.328	4.115	3.279	3.869	3.393
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.724	0.465	0.625	0.777	0.839	0.785	0.842
Variance	0.523	0.216	0.391	0.603	0.704	0.616	0.709
Minimum	2	3	3	2	1	2	2
Maximum	5	5	5	5	5	5	5

Table 56. Descriptive Statistics, Technology Indicators (Global Organizations)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	48	48	48	48	48	48	48
Missing	0	0	0	0	0	0	0
Mean	3.375	3.875	4.063	3.938	3.250	3.667	3.250
Median	4.000	4.000	4.000	4.000	3.500	4.000	3.000
Std. Deviation	1.024	0.703	0.755	0.885	0.957	0.883	0.887
Variance	1.048	0.495	0.570	0.783	0.915	0.780	0.787
Minimum	1	2	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

Table 57. Descriptive Statistics, Technology Indicators (Small Organizations)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	53	53	53	53	53	53	53
Missing	0	0	0	0	0	0	0
Mean	3.547	3.830	4.094	3.962	3.321	3.698	3.358
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.889	0.643	0.628	0.759	0.872	0.774	0.811
Variance	0.791	0.413	0.395	0.575	0.761	0.599	0.657
Minimum	1	2	2	2	1	2	2
Maximum	5	5	5	5	5	5	5

Table 58. Descriptive Statistics, Technology Indicators (Large Organizations)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	56	56	56	56	56	56	56
Missing	0	0	0	0	0	0	0
Mean	3.786	4.036	4.321	4.107	3.214	3.857	3.304
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.909	0.503	0.741	0.888	0.909	0.883	0.913
Variance	0.826	0.253	0.549	0.788	0.826	0.779	0.833
Minimum	1	3	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

Table 59. Descriptive Statistics, Technology Indicators (Mobile ICT Deployed)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0
Mean	3.753	4.000	4.235	4.049	3.247	3.790	3.346
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.916	0.548	0.676	0.865	0.916	0.817	0.924
Variance	0.838	0.300	0.457	0.748	0.838	0.668	0.854
Minimum	1	2	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

Table 60. Descriptive Statistics, Technology Indicators (Mobile ICT Not Deployed)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	28	28	28	28	28	28	28
Missing	0	0	0	0	0	0	0
Mean	3.429	3.750	4.143	4.000	3.321	3.750	3.286
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.836	0.645	0.756	0.720	0.819	0.887	0.659
Variance	0.698	0.417	0.571	0.519	0.671	0.787	0.434
Minimum	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 61. Descriptive Statistics, Technology Indicators (Mobile ICT Strategy)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	64	64	64	64	64	64	64
Missing	0	0	0	0	0	0	0
Mean	3.703	4.047	4.281	4.125	3.250	3.859	3.406
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.903	0.547	0.678	0.882	0.976	0.852	0.938
Variance	0.815	0.299	0.459	0.778	0.952	0.726	0.880
Minimum	1	2	2	2	1	2	1
Maximum	5	5	5	5	5	5	5

Table 62. Descriptive Statistics, Technology Indicators (No Mobile ICT Strategy)

	T 1	T 2	T 3	T 4	T 5	T 6	T 7
N valid	45	45	45	45	45	45	45
Missing	0	0	0	0	0	0	0
Mean	3.622	3.778	4.111	3.911	3.289	3.667	3.222
Median	4.000	4.000	4.000	4.000	3.000	4.000	3.000
Std. Deviation	0.912	0.599	0.714	0.733	0.757	0.798	0.735
Variance	0.831	0.359	0.510	0.537	0.574	0.636	0.540
Minimum	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 63. Descriptive Statistics, Data&Info Indicators (Academics)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	58	58	58	58	58
Missing	0	0	0	0	0
Mean	4.017	3.966	3.793	4.017	3.879
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.662	0.794	0.695	0.737	0.651
Variance	0.438	0.630	0.483	0.544	0.424
Minimum	2	1	2	2	2
Maximum	5	5	5	5	5

Table 64. Descriptive Statistics, Data&Info Indicators (Industry)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	51	51	51	51	51
Missing	0	0	0	0	0
Mean	3.843	4.275	3.863	3.922	3.863
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.946	0.850	0.800	0.688	0.917
Variance	0.895	0.723	0.641	0.474	0.841
Minimum	1	2	2	2	2
Maximum	5	5	5	5	5

Table 65. Descriptive Statistics, Data&Info Indicators (US Organizations)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	61	61	61	61	61
Missing	0	0	0	0	0
Mean	3.951	4.311	3.885	3.967	3.918
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.805	0.743	0.777	0.657	0.781
Variance	0.648	0.551	0.603	0.432	0.610
Minimum	1	2	2	2	2
Maximum	5	5	5	5	5

Table 66. Descriptive Statistics, Data&Info Indicators (Global Organizations)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	48	48	48	48	48
Missing	0	0	0	0	0
Mean	3.917	3.854	3.750	3.979	3.813
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.821	0.875	0.700	0.785	0.790
Variance	0.674	0.766	0.489	0.617	0.624
Minimum	1	1	2	2	2
Maximum	5	5	5	5	5

Table 67. Descriptive Statistics, Data&Info Indicators (Small Organizations)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	53	53	53	53	53
Missing	0	0	0	0	0
Mean	3.962	4.170	3.811	3.962	3.887
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.808	0.753	0.622	0.678	0.800
Variance	0.652	0.567	0.387	0.460	0.641
Minimum	1	2	3	2	2
Maximum	5	5	5	5	5

Table 68. Descriptive Statistics, Data&Info Indicators (Large Organizations)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	56	56	56	56	56
Missing	0	0	0	0	0
Mean	3.911	4.054	3.839	3.982	3.857
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.815	0.903	0.848	0.751	0.773
Variance	0.665	0.815	0.719	0.563	0.597
Minimum	1	1	2	2	2
Maximum	5	5	5	5	5

Table 69. Descriptive Statistics, Data&Info Indicators (Mobile ICT Deployed)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	81	81	81	81	81
Missing	0	0	0	0	0
Mean	3.877	4.173	3.840	3.926	3.914
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.857	0.818	0.749	0.738	0.809
Variance	0.735	0.670	0.561	0.544	0.655
Minimum	1	1	2	2	2
Maximum	5	5	5	5	5

Table 70. Descriptive Statistics, Data&Info Indicators (Mobile ICT Not Deployed)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	28	28	28	28	28
Missing	0	0	0	0	0
Mean	4.107	3.929	3.786	4.107	3.750
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.629	0.858	0.738	0.629	0.701
Variance	0.396	0.735	0.545	0.396	0.491
Minimum	3	2	2	3	2
Maximum	5	5	5	5	5

Table 71. Descriptive Statistics, Data&Info Indicators (Mobile ICT Strategy)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	64	64	64	64	64
Missing	0	0	0	0	0
Mean	3.922	4.219	3.844	3.922	3.953
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.948	0.845	0.718	0.803	0.862
Variance	0.899	0.713	0.515	0.645	0.744
Minimum	1	1	2	2	2
Maximum	5	5	5	5	5

Table 72. Descriptive Statistics, Data&Info Indicators (No Mobile ICT Strategy)

	D&I 1	D&I 2	D&I 3	D&I 4	D&I 5
N valid	45	45	45	45	45
Missing	0	0	0	0	0
Mean	3.956	3.956	3.800	4.044	3.756
Median	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.562	0.796	0.786	0.562	0.645
Variance	0.316	0.634	0.618	0.316	0.416
Minimum	3	2	2	3	2
Maximum	5	5	5	5	5

Table 73. Descriptive Statistics, Process Indicators (Academics)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	58	58	58	58	58	58
Missing	0	0	0	0	0	0
Mean	3.776	3.983	3.862	3.879	3.621	3.552
Median	4.000	4.000	4.000	4.000	4.000	3.000
Std. Deviation	0.859	0.662	0.712	0.564	0.791	0.862
Variance	0.738	0.438	0.507	0.319	0.626	0.743
Minimum	2	2	2	3	2	2
Maximum	5	5	5	5	5	5

Table 74. Descriptive Statistics, Process Indicators (Industry)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	51	51	51	51	51	51
Missing	0	0	0	0	0	0
Mean	3.882	4.039	3.627	3.863	3.824	3.588
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.653	0.799	0.848	0.722	0.684	0.876
Variance	0.426	0.638	0.718	0.521	0.468	0.767
Minimum	2	2	1	2	3	2
Maximum	5	5	5	5	5	5

Table 75. Descriptive Statistics, Process Indicators (US Organizations)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	61	61	61	61	61	61
Missing	0	0	0	0	0	0
Mean	3.918	4.098	3.738	3.902	3.754	3.607
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.690	0.724	0.772	0.597	0.650	0.842
Variance	0.477	0.523	0.597	0.357	0.422	0.709
Minimum	2	2	2	3	3	2
Maximum	5	5	5	5	5	5

Table 76. Descriptive Statistics, Process Indicators (Global Organizations)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	48	48	48	48	48	48
Missing	0	0	0	0	0	0
Mean	3.708	3.896	3.771	3.833	3.667	3.521
Median	4.000	4.000	4.000	4.000	4.000	3.500
Std. Deviation	0.849	0.722	0.805	0.694	0.859	0.899
Variance	0.722	0.521	0.648	0.482	0.738	0.808
Minimum	2	2	1	2	2	2
Maximum	5	5	5	5	5	5

Table 77. Descriptive Statistics, Process Indicators (Small Organizations)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	53	53	53	53	53	53
Missing	0	0	0	0	0	0
Mean	3.830	3.925	3.755	3.811	3.660	3.679
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.753	0.703	0.757	0.652	0.706	0.728
Variance	0.567	0.494	0.573	0.425	0.498	0.530
Minimum	2	2	2	2	2	2
Maximum	5	5	5	5	5	5

Table 78. Descriptive Statistics, Process Indicators (Large Organizations)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	56	56	56	56	56	56
Missing	0	0	0	0	0	0
Mean	3.821	4.089	3.750	3.929	3.768	3.464
Median	4.000	4.000	4.000	4.000	4.000	3.000
Std. Deviation	0.789	0.745	0.815	0.628	0.786	0.972
Variance	0.622	0.556	0.664	0.395	0.618	0.944
Minimum	2	2	1	2	2	2
Maximum	5	5	5	5	5	5

Table 79. Descriptive Statistics, Process Indicators (Mobile ICT Deployed)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	81	81	81	81	81	81
Missing	0	0	0	0	0	0
Mean	3.802	4.025	3.728	3.889	3.778	3.556
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.797	0.707	0.806	0.612	0.775	0.922
Variance	0.635	0.499	0.650	0.375	0.600	0.850
Minimum	2	2	1	2	2	2
Maximum	5	5	5	5	5	5

Table 80. Descriptive Statistics, Process Indicators (Mobile ICT Not Deployed)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	28	28	28	28	28	28
Missing	0	0	0	0	0	0
Mean	3.893	3.964	3.821	3.821	3.536	3.607
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.685	0.793	0.723	0.723	0.637	0.685
Variance	0.470	0.628	0.522	0.522	0.406	0.470
Minimum	2	2	2	3	2	2
Maximum	5	5	5	5	5	5

Table 81. Descriptive Statistics, Process Indicators (Mobile ICT Strategy)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	64	64	64	64	64	64
Missing	0	0	0	0	0	0
Mean	3.891	4.125	3.719	3.938	3.859	3.688
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.737	0.724	0.845	0.588	0.710	0.924
Variance	0.543	0.524	0.713	0.345	0.504	0.853
Minimum	2	2	1	2	2	2
Maximum	5	5	5	5	5	5

Table 82. Descriptive Statistics, Process Indicators (No Mobile ICT Strategy)

	P 1	P 2	P 3	P 4	P 5	P 6
N valid	45	45	45	45	45	45
Missing	0	0	0	0	0	0
Mean	3.733	3.844	3.800	3.778	3.511	3.400
Median	4.000	4.000	4.000	4.000	4.000	3.000
Std. Deviation	0.809	0.706	0.694	0.704	0.757	0.751
Variance	0.655	0.498	0.482	0.495	0.574	0.564
Minimum	2	2	2	3	2	2
Maximum	5	5	5	5	5	5

Table 83. Descriptive Statistics, Knowledge Indicators (Academics)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	58	58	58	58	58	58	58	58	58
Missing	0	0	0	0	0	0	0	0	0
Mean	4.138	3.672	4.172	3.759	3.741	4.155	3.190	3.966	3.672
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.736	0.758	0.625	0.757	0.762	0.586	0.826	0.725	0.803
Variance	0.542	0.575	0.391	0.572	0.581	0.344	0.683	0.525	0.645
Minimum	2	2	3	2	2	3	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 84. Descriptive Statistics, Knowledge Indicators (Industry)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	51	51	51	51	51	51	51	51	51
Missing	0	0	0	0	0	0	0	0	0
Mean	4.039	3.922	4.118	3.706	3.588	4.118	3.333	3.804	3.529
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.774	0.796	0.739	0.756	0.942	0.588	0.931	0.775	0.924
Variance	0.598	0.634	0.546	0.572	0.887	0.346	0.867	0.601	0.854
Minimum	1	2	2	2	1	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 85. Descriptive Statistics, Knowledge Indicators (US Organizations)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	61	61	61	61	61	61	61	61	61
Missing	0	0	0	0	0	0	0	0	0
Mean	4.131	3.852	4.230	3.787	3.590	4.164	3.393	3.885	3.525
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.695	0.813	0.589	0.661	0.804	0.583	0.737	0.733	0.868
Variance	0.483	0.661	0.346	0.437	0.646	0.339	0.543	0.537	0.754
Minimum	2	2	3	2	2	3	2	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 86. Descriptive Statistics, Knowledge Indicators (Global Organizations)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	48	48	48	48	48	48	48	48	48
Missing	0	0	0	0	0	0	0	0	0
Mean	4.042	3.708	4.042	3.667	3.771	4.104	3.083	3.896	3.708
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.824	0.743	0.771	0.859	0.905	0.592	1.007	0.778	0.849
Variance	0.679	0.551	0.594	0.738	0.819	0.351	1.014	0.606	0.722
Minimum	1	2	2	2	1	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 87. Descriptive Statistics, Knowledge Indicators (Small Organizations)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	53	53	53	53	53	53	53	53	53
Missing	0	0	0	0	0	0	0	0	0
Mean	4.132	3.774	4.151	3.849	3.566	4.151	3.302	3.717	3.566
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.556	0.800	0.690	0.744	0.910	0.601	0.774	0.690	0.866
Variance	0.309	0.640	0.477	0.554	0.827	0.361	0.599	0.476	0.750
Minimum	3	2	2	2	2	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 88. Descriptive Statistics, Knowledge Indicators (Large Organizations)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	56	56	56	56	56	56	56	56	56
Missing	0	0	0	0	0	0	0	0	0
Mean	4.054	3.804	4.143	3.625	3.768	4.125	3.214	4.054	3.643
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.903	0.773	0.672	0.752	0.786	0.574	0.967	0.773	0.862
Variance	0.815	0.597	0.452	0.566	0.618	0.330	0.935	0.597	0.743
Minimum	1	2	2	2	1	3	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 89. Descriptive Statistics, Knowledge Indicators (Mobile ICT Deployed)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	81	81	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0	0	0
Mean	4.123	3.938	4.173	3.790	3.753	4.148	3.296	3.951	3.667
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.797	0.747	0.703	0.720	0.859	0.615	0.914	0.669	0.866
Variance	0.635	0.559	0.495	0.518	0.738	0.378	0.836	0.448	0.750
Minimum	1	2	2	2	1	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 90. Descriptive Statistics, Knowledge Indicators (Mobile ICT Not Deployed)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	28	28	28	28	28	28	28	28	28
Missing	0	0	0	0	0	0	0	0	0
Mean	4.000	3.357	4.071	3.571	3.429	4.107	3.143	3.714	3.429
Median	4.000	3.000	4.000	4.000	3.000	4.000	3.000	4.000	3.500
Std. Deviation	0.609	0.731	0.604	0.836	0.790	0.497	0.756	0.937	0.836
Variance	0.370	0.534	0.365	0.698	0.624	0.247	0.571	0.878	0.698
Minimum	3	2	3	2	2	3	1	2	2
Maximum	5	5	5	5	5	5	4	5	5

Table 91. Descriptive Statistics, Knowledge Indicators (Mobile ICT Strategy)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	64	64	64	64	64	64	64	64	64
Missing	0	0	0	0	0	0	0	0	0
Mean	4.094	4.000	4.141	3.766	3.688	4.141	3.250	3.906	3.641
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.830	0.735	0.753	0.750	0.906	0.639	0.976	0.729	0.949
Variance	0.689	0.540	0.567	0.563	0.821	0.408	0.952	0.531	0.901
Minimum	1	2	2	2	1	2	1	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 92. Descriptive Statistics, Knowledge Indicators (No Mobile ICT Strategy)

	K 1	K 2	K 3	K 4	K 5	K 6	K 7	K 8	K 9
N valid	45	45	45	45	45	45	45	45	45
Missing	0	0	0	0	0	0	0	0	0
Mean	4.089	3.489	4.156	3.689	3.644	4.133	3.267	3.867	3.556
Median	4.000	4.000	4.000	4.000	4.000	4.000	3.000	4.000	4.000
Std. Deviation	0.633	0.757	0.562	0.763	0.773	0.505	0.720	0.786	0.725
Variance	0.401	0.574	0.316	0.583	0.598	0.255	0.518	0.618	0.525
Minimum	3	2	3	2	2	3	2	2	2
Maximum	5	5	5	5	5	5	5	5	5

Table 93. Descriptive Statistics, Resource Indicators (Academics)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	58	58	58	58	58	58	58
Missing	0	0	0	0	0	0	0
Mean	4.190	4.138	3.724	3.621	3.759	4.069	3.672
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.712	0.736	0.696	0.768	0.757	0.915	0.735
Variance	0.507	0.542	0.484	0.590	0.572	0.837	0.540
Minimum	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 94. Descriptive Statistics, Resource Indicators (Industry)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	51	51	51	51	51	51	51
Missing	0	0	0	0	0	0	0
Mean	4.020	4.118	3.627	3.569	3.922	4.118	3.725
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.812	0.864	0.799	0.806	0.595	0.952	0.896
Variance	0.660	0.746	0.638	0.650	0.354	0.906	0.803
Minimum	2	1	2	2	3	2	2
Maximum	5	5	5	5	5	5	5

Table 95. Descriptive Statistics, Resource Indicators (US Organizations)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	61	61	61	61	61	61	61
Missing	0	0	0	0	0	0	0
Mean	4.197	4.213	3.738	3.607	3.885	4.295	3.689
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.703	0.710	0.656	0.737	0.635	0.760	0.720
Variance	0.494	0.504	0.430	0.543	0.403	0.578	0.518
Minimum	2	3	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 96. Descriptive Statistics, Resource Indicators (Global Organizations)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	48	48	48	48	48	48	48
Missing	0	0	0	0	0	0	0
Mean	4.000	4.021	3.604	3.583	3.771	3.833	3.708
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.825	0.887	0.844	0.846	0.751	1.059	0.922
Variance	0.681	0.787	0.712	0.716	0.563	1.121	0.849
Minimum	1	1	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 97. Descriptive Statistics, Resource Indicators (Small Organizations)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	53	53	53	53	53	53	53
Missing	0	0	0	0	0	0	0
Mean	4.000	4.113	3.547	3.585	3.906	4.057	3.642
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.760	0.725	0.667	0.633	0.628	0.886	0.710
Variance	0.577	0.525	0.445	0.401	0.395	0.785	0.504
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 98. Descriptive Statistics, Resource Indicators (Large Organizations)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	56	56	56	56	56	56	56
Missing	0	0	0	0	0	0	0
Mean	4.214	4.143	3.804	3.607	3.768	4.125	3.750
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.756	0.862	0.796	0.908	0.738	0.974	0.899
Variance	0.571	0.743	0.633	0.825	0.545	0.948	0.809
Minimum	1	1	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 99. Descriptive Statistics, Resource Indicators (Mobile ICT Deployed)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0
Mean	4.123	4.148	3.716	3.605	3.840	4.086	3.728
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.731	0.808	0.762	0.785	0.661	0.925	0.837
Variance	0.535	0.653	0.581	0.617	0.436	0.855	0.700
Minimum	2	1	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 100. Descriptive Statistics, Resource Indicators (Mobile ICT Not Deployed)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	28	28	28	28	28	28	28
Missing	0	0	0	0	0	0	0
Mean	4.071	4.071	3.571	3.571	3.821	4.107	3.607
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.858	0.766	0.690	0.790	0.772	0.956	0.737
Variance	0.735	0.587	0.476	0.624	0.597	0.914	0.544
Minimum	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 101. Descriptive Statistics, Resource Indicators (Mobile ICT Strategy)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	64	64	64	64	64	64	64
Missing	0	0	0	0	0	0	0
Mean	4.078	4.109	3.719	3.609	3.875	4.078	3.703
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.762	0.838	0.766	0.847	0.701	0.948	0.830
Variance	0.581	0.702	0.586	0.718	0.492	0.899	0.688
Minimum	2	1	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 102. Descriptive Statistics, Resource Indicators (No Mobile ICT Strategy)

	R 1	R 2	R 3	R 4	R 5	R 6	R 7
N valid	45	45	45	45	45	45	45
Missing	0	0	0	0	0	0	0
Mean	4.156	4.156	3.622	3.578	3.778	4.111	3.689
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.767	0.737	0.716	0.690	0.670	0.910	0.793
Variance	0.589	0.543	0.513	0.477	0.449	0.828	0.628
Minimum	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 103. Descriptive Statistics, Leadership Indicators (Academics)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	58	58	58	58	58	58	58	58
Missing	0	0	0	0	0	0	0	0
Mean	4.155	4.086	4.224	3.483	3.638	4.190	3.879	3.776
Median	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	0.790	0.779	0.702	0.863	0.788	0.687	0.796	0.796
Variance	0.625	0.606	0.493	0.745	0.621	0.472	0.634	0.633
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

Table 104. Descriptive Statistics, Leadership Indicators (Industry)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	51	51	51	51	51	51	51	51
Missing	0	0	0	0	0	0	0	0
Mean	4.333	4.216	4.392	3.647	3.765	4.314	3.882	4.039
Median	4.000	4.000	5.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.792	0.757	0.750	0.770	0.929	0.616	0.791	0.720
Variance	0.627	0.573	0.563	0.593	0.864	0.380	0.626	0.518
Minimum	2	2	2	2	2	3	2	3
Maximum	5	5	5	5	5	5	5	5

Table 105. Descriptive Statistics, Leadership Indicators (US Organizations)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	61	61	61	61	61	61	61	61
Missing	0	0	0	0	0	0	0	0
Mean	4.230	4.180	4.328	3.508	3.820	4.311	3.902	4.049
Median	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	0.783	0.785	0.724	0.809	0.785	0.593	0.768	0.717
Variance	0.613	0.617	0.524	0.654	0.617	0.351	0.590	0.514
Minimum	2	2	2	2	2	3	2	3
Maximum	5	5	5	5	5	5	5	5

Table 106. Descriptive Statistics, Leadership Indicators (Global Organizations)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	48	48	48	48	48	48	48	48
Missing	0	0	0	0	0	0	0	0
Mean	4.250	4.104	4.271	3.625	3.542	4.167	3.854	3.708
Median	4.000	4.000	4.000	4.000	3.500	4.000	4.000	4.000
Std. Deviation	0.812	0.751	0.736	0.841	0.922	0.724	0.825	0.798
Variance	0.660	0.563	0.542	0.707	0.849	0.525	0.680	0.637
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

Table 107. Descriptive Statistics, Leadership Indicators (Small Organizations)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	53	53	53	53	53	53	53	53
Missing	0	0	0	0	0	0	0	0
Mean	4.189	4.208	4.264	3.547	3.717	4.283	3.925	3.868
Median	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	0.709	0.717	0.763	0.774	0.841	0.568	0.703	0.652
Variance	0.502	0.514	0.583	0.599	0.707	0.322	0.494	0.425
Minimum	2	2	2	2	2	3	2	3
Maximum	5	5	5	5	5	5	5	5

Table 108. Descriptive Statistics, Leadership Indicators (Large Organizations)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	56	56	56	56	56	56	56	56
Missing	0	0	0	0	0	0	0	0
Mean	4.286	4.089	4.339	3.571	3.679	4.214	3.839	3.929
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.868	0.815	0.695	0.871	0.876	0.731	0.869	0.871
Variance	0.753	0.665	0.483	0.758	0.768	0.535	0.756	0.758
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

Table 109. Descriptive Statistics, Leadership Indicators (Mobile ICT Deployed)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	81	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0	0
Mean	4.333	4.173	4.346	3.691	3.679	4.259	3.901	3.926
Median	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.742	0.738	0.727	0.801	0.878	0.628	0.831	0.771
Variance	0.550	0.545	0.529	0.641	0.771	0.394	0.690	0.594
Minimum	2	2	2	2	2	3	2	2
Maximum	5	5	5	5	5	5	5	5

Table 110. Descriptive Statistics, Leadership Indicators (Mobile ICT Not Deployed)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	28	28	28	28	28	28	28	28
Missing	0	0	0	0	0	0	0	0
Mean	3.964	4.071	4.179	3.179	3.750	4.214	3.821	3.821
Median	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	0.881	0.858	0.723	0.772	0.799	0.738	0.670	0.772
Variance	0.776	0.735	0.522	0.597	0.639	0.545	0.448	0.597
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

Table 111. Descriptive Statistics, Leadership Indicators (Mobile ICT Strategy)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	64	64	64	64	64	64	64	64
Missing	0	0	0	0	0	0	0	0
Mean	4.375	4.188	4.328	3.672	3.688	4.266	3.969	3.906
Median	5.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.766	0.774	0.757	0.837	0.906	0.648	0.816	0.750
Variance	0.587	0.599	0.573	0.700	0.821	0.420	0.666	0.563
Minimum	2	2	2	2	2	3	2	3
Maximum	5	5	5	5	5	5	5	5

Table 112. Descriptive Statistics, Leadership Indicators (No Mobile ICT Strategy)

	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8
N valid	45	45	45	45	45	45	45	45
Missing	0	0	0	0	0	0	0	0
Mean	4.044	4.089	4.267	3.400	3.711	4.222	3.756	3.889
Median	4.000	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	0.796	0.763	0.688	0.780	0.787	0.670	0.743	0.804
Variance	0.634	0.583	0.473	0.609	0.619	0.449	0.553	0.646
Minimum	1	1	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5	5

Table 113. Descriptive Statistics, Employee Indicators (Academics)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	58	58	58	58	58	58
Missing	0	0	0	0	0	0
Mean	3.379	3.621	4.138	3.966	3.466	3.966
Median	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.813	0.895	0.687	0.772	0.754	0.725
Variance	0.661	0.801	0.472	0.595	0.569	0.525
Minimum	2	1	2	2	2	3
Maximum	5	5	5	5	5	5

Table 114. Descriptive Statistics, Employee Indicators (Industry)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	51	51	51	51	51	51
Missing	0	0	0	0	0	0
Mean	3.686	3.627	4.137	4.157	3.373	3.902
Median	4.000	4.000	4.000	4.000	3.000	4.000
Std. Deviation	0.836	0.958	0.601	0.543	0.871	0.700
Variance	0.700	0.918	0.361	0.295	0.758	0.490
Minimum	2	1	3	3	2	2
Maximum	5	5	5	5	5	5

Table 115. Descriptive Statistics, Employee Indicators (US Organizations)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	61	61	61	61	61	61
Missing	0	0	0	0	0	0
Mean	3.607	3.590	4.082	4.033	3.295	3.934
Median	4.000	4.000	4.000	4.000	3.000	4.000
Std. Deviation	0.737	0.938	0.640	0.632	0.823	0.655
Variance	0.543	0.879	0.410	0.399	0.678	0.429
Minimum	2	1	3	2	2	2
Maximum	5	5	5	5	5	5

Table 116. Descriptive Statistics, Employee Indicators (Global Organizations)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	48	48	48	48	48	48
Missing	0	0	0	0	0	0
Mean	3.417	3.667	4.208	4.083	3.583	3.938
Median	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.942	0.907	0.651	0.739	0.767	0.783
Variance	0.887	0.823	0.424	0.546	0.589	0.613
Minimum	2	1	2	2	2	3
Maximum	5	5	5	5	5	5

Table 117. Descriptive Statistics, Employee Indicators (Small Organizations)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	53	53	53	53	53	53
Missing	0	0	0	0	0	0
Mean	3.491	3.604	4.075	4.038	3.472	3.868
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.775	0.927	0.646	0.678	0.823	0.708
Variance	0.601	0.859	0.417	0.460	0.677	0.501
Minimum	2	1	2	2	2	2
Maximum	5	5	5	5	5	5

Table 118. Descriptive Statistics, Employee Indicators (Large Organizations)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	56	56	56	56	56	56
Missing	0	0	0	0	0	0
Mean	3.554	3.643	4.196	4.071	3.375	4.000
Median	3.500	4.000	4.000	4.000	3.000	4.000
Std. Deviation	0.893	0.923	0.644	0.684	0.799	0.714
Variance	0.797	0.852	0.415	0.468	0.639	0.509
Minimum	2	1	3	2	2	3
Maximum	5	5	5	5	5	5

Table 119. Descriptive Statistics, Employee Indicators (Mobile ICT Deployed)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	81	81	81	81	81	81
Missing	0	0	0	0	0	0
Mean	3.630	3.716	4.198	4.123	3.469	3.975
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.843	0.825	0.621	0.640	0.776	0.707
Variance	0.711	0.681	0.385	0.410	0.602	0.499
Minimum	2	1	3	2	2	3
Maximum	5	5	5	5	5	5

Table 120. Descriptive Statistics, Employee Indicators (Mobile ICT Not Deployed)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	28	28	28	28	28	28
Missing	0	0	0	0	0	0
Mean	3.214	3.357	3.964	3.857	3.286	3.821
Median	3.000	3.500	4.000	4.000	3.000	4.000
Std. Deviation	0.738	1.129	0.693	0.756	0.897	0.723
Variance	0.545	1.275	0.480	0.571	0.804	0.522
Minimum	2	1	2	2	2	2
Maximum	4	5	5	5	5	5

Table 121. Descriptive Statistics, Employee Indicators (Mobile ICT Strategy)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	64	64	64	64	64	64
Missing	0	0	0	0	0	0
Mean	3.656	3.703	4.219	4.141	3.516	4.016
Median	4.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.821	0.849	0.629	0.639	0.836	0.678
Variance	0.674	0.720	0.396	0.408	0.698	0.460
Minimum	2	1	3	2	2	3
Maximum	5	5	5	5	5	5

Table 122. Descriptive Statistics, Employee Indicators (No Mobile ICT Strategy)

	E 1	E 2	E 3	E 4	E 5	E 6
N valid	45	45	45	45	45	45
Missing	0	0	0	0	0	0
Mean	3.333	3.511	4.022	3.933	3.289	3.822
Median	3.000	4.000	4.000	4.000	3.000	4.000
Std. Deviation	0.826	1.014	0.657	0.720	0.757	0.747
Variance	0.682	1.028	0.431	0.518	0.574	0.559
Minimum	2	1	2	2	2	2
Maximum	5	5	5	5	5	5

Table 123. Descriptive Statistics, V&G Indicators (Academics)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	58	58	58	58	58	58	58
Missing	0	0	0	0	0	0	0
Mean	4.052	3.155	3.534	3.741	3.724	3.552	3.672
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.711	0.670	0.754	0.785	0.744	0.776	0.886
Variance	0.506	0.449	0.569	0.616	0.554	0.603	0.786
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 124. Descriptive Statistics, V&G Indicators (Industry)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	51	51	51	51	51	51	51
Missing	0	0	0	0	0	0	0
Mean	3.961	3.373	4.020	3.824	3.902	4.118	3.608
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.631	0.799	0.616	0.888	0.755	0.475	0.874
Variance	0.398	0.638	0.380	0.788	0.570	0.226	0.763
Minimum	2	2	2	2	2	3	1
Maximum	5	5	5	5	5	5	5

Table 125. Descriptive Statistics, V&G Indicators (US Organizations)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	61	61	61	61	61	61	61
Missing	0	0	0	0	0	0	0
Mean	3.984	3.410	3.820	3.689	3.869	3.885	3.738
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.619	0.716	0.742	0.827	0.718	0.709	0.835
Variance	0.383	0.513	0.550	0.685	0.516	0.503	0.697
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 126. Descriptive Statistics, V&G Indicators (Global Organizations)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	48	48	48	48	48	48	48
Missing	0	0	0	0	0	0	0
Mean	4.042	3.063	3.688	3.896	3.729	3.729	3.521
Median	4.000	3.000	4.000	4.000	4.000	4.000	3.500
Std. Deviation	0.743	0.727	0.719	0.831	0.792	0.707	0.922
Variance	0.551	0.528	0.517	0.691	0.627	0.500	0.851
Minimum	2	2	2	2	2	2	1
Maximum	5	5	5	5	5	5	5

Table 127. Descriptive Statistics, V&G Indicators (Small Organizations)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	53	53	53	53	53	53	53
Missing	0	0	0	0	0	0	0
Mean	3.943	3.189	3.717	3.604	3.868	3.906	3.566
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.691	0.709	0.769	0.862	0.735	0.687	0.772
Variance	0.478	0.502	0.591	0.744	0.540	0.472	0.597
Minimum	2	2	2	2	2	2	1
Maximum	5	5	5	5	5	5	5

Table 128. Descriptive Statistics, V&G Indicators (Large Organizations)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	56	56	56	56	56	56	56
Missing	0	0	0	0	0	0	0
Mean	4.071	3.321	3.804	3.946	3.750	3.732	3.714
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.657	0.765	0.699	0.773	0.769	0.726	0.967
Variance	0.431	0.586	0.488	0.597	0.591	0.527	0.935
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 129. Descriptive Statistics, V&G Indicators (Mobile ICT Deployed)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	81	81	81	81	81	81	81
Missing	0	0	0	0	0	0	0
Mean	4.049	3.259	3.864	3.790	3.840	3.864	3.605
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.650	0.738	0.703	0.832	0.749	0.685	0.918
Variance	0.423	0.544	0.494	0.693	0.561	0.469	0.842
Minimum	2	2	2	2	2	2	1
Maximum	5	5	5	5	5	5	5

Table 130. Descriptive Statistics, V&G Indicators (Mobile ICT Not Deployed)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	28	28	28	28	28	28	28
Missing	0	0	0	0	0	0	0
Mean	3.893	3.250	3.464	3.750	3.714	3.679	3.750
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.737	0.752	0.744	0.844	0.763	0.772	0.752
Variance	0.544	0.565	0.554	0.713	0.582	0.597	0.565
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 131. Descriptive Statistics, V&G Indicators (Mobile ICT Strategy)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	64	64	64	64	64	64	64
Missing	0	0	0	0	0	0	0
Mean	4.063	3.313	3.859	3.844	3.844	3.938	3.563
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.664	0.710	0.732	0.840	0.761	0.732	0.924
Variance	0.440	0.504	0.535	0.705	0.578	0.536	0.853
Minimum	2	2	2	2	2	2	1
Maximum	5	5	5	5	5	5	5

Table 132. Descriptive Statistics, V&G Indicators (No Mobile ICT Strategy)

	V&G 1	V&G 2	V&G 3	V&G 4	V&G 5	V&G 6	V&G 7
N valid	45	45	45	45	45	45	45
Missing	0	0	0	0	0	0	0
Mean	3.933	3.178	3.622	3.689	3.756	3.644	3.756
Median	4.000	3.000	4.000	4.000	4.000	4.000	4.000
Std. Deviation	0.688	0.777	0.716	0.821	0.743	0.645	0.802
Variance	0.473	0.604	0.513	0.674	0.553	0.416	0.643
Minimum	2	2	2	2	2	2	2
Maximum	5	5	5	5	5	5	5

Table 133. Avg. and Transformed Response w/ Design Matrix (Academics)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.431	-0.918	1	1	1	1	1	1	1	1
2	2.534	-0.206	1	1	2	1	2	2	3	3
3	2.948	-0.022	1	1	3	1	3	3	2	2
4	2.690	-0.136	1	2	1	2	2	3	1	2
5	2.845	-0.068	1	2	2	2	3	1	3	1
6	2.948	-0.022	1	2	3	2	1	2	2	3
7	3.138	0.060	1	3	1	3	3	2	1	3
8	3.431	0.190	1	3	2	3	1	3	3	2
9	3.000	0.000	1	3	3	3	2	1	2	1
10	2.517	-0.214	2	1	1	2	2	2	2	1
11	3.207	0.090	2	1	2	2	3	3	1	3
12	2.759	-0.105	2	1	3	2	1	1	3	2
13	2.897	-0.045	2	2	1	3	3	1	2	2
14	2.828	-0.075	2	2	2	3	1	2	1	1
15	4.207	0.607	2	2	3	3	2	3	3	3
16	2.966	-0.015	2	3	1	1	1	3	2	3
17	2.621	-0.167	2	3	2	1	2	1	1	2
18	3.603	0.270	2	3	3	1	3	2	3	1
19	3.690	0.312	3	1	1	3	3	3	3	1
20	2.793	-0.090	3	1	2	3	1	1	2	3
21	3.207	0.090	3	1	3	3	2	2	1	2
22	2.776	-0.098	3	2	1	1	1	2	3	2
23	3.466	0.206	3	2	2	1	2	3	2	1
24	3.241	0.105	3	2	3	1	3	1	1	3
25	3.310	0.136	3	3	1	2	2	1	3	3
26	3.879	0.410	3	3	2	2	3	2	2	2
27	3.569	0.254	3	3	3	2	1	3	1	1

Regression equation

Average(Acad) = - 0.379 + 0.276 Tech + 0.246 DataInfo + 0.226 Proc + 0.200 Know + 0.219 Res + 0.293 Lead + 0.179 Empl + 0.0775 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.3790	0.1212	-3.13	0.006
Tech	0.27589	0.02121	13.01	0.000
DataInfo	0.24617	0.02121	11.61	0.000
Proc	0.22594	0.02121	10.65	0.000
Know	0.20028	0.02121	9.44	0.000
Res	0.21928	0.02121	10.34	0.000
Lead	0.29317	0.02121	13.82	0.000
Empl	0.17906	0.02121	8.44	0.000
ValGoals	0.07750	0.02121	3.65	0.002

S = 0.0899710   R-Sq = 98.0%   R-Sq(adj) = 97.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.19948	0.89994	111.17	0.000
Residual Error	18	0.14571	0.00809		
Total	26	7.34519			

Regression equation

z (Acad) = - 1.75 + 0.136 Tech + 0.122 DataInfo + 0.116 Proc + 0.105 Know + 0.111 Res + 0.147 Lead + 0.0964 Empl + 0.0499 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.74622	0.06642	-26.29	0.000
Tech	0.13594	0.01162	11.70	0.000
DataInfo	0.12228	0.01162	10.52	0.000
Proc	0.11639	0.01162	10.02	0.000
Know	0.10522	0.01162	9.06	0.000
Res	0.11061	0.01162	9.52	0.000
Lead	0.14656	0.01162	12.61	0.000
Empl	0.09639	0.01162	8.29	0.000
ValGoals	0.04989	0.01162	4.29	0.000

S = 0.0493005   R-Sq = 97.7%   R-Sq(adj) = 96.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.86379	0.23297	95.85	0.000
Residual Error	18	0.04375	0.00243		
Total	26	1.90754			

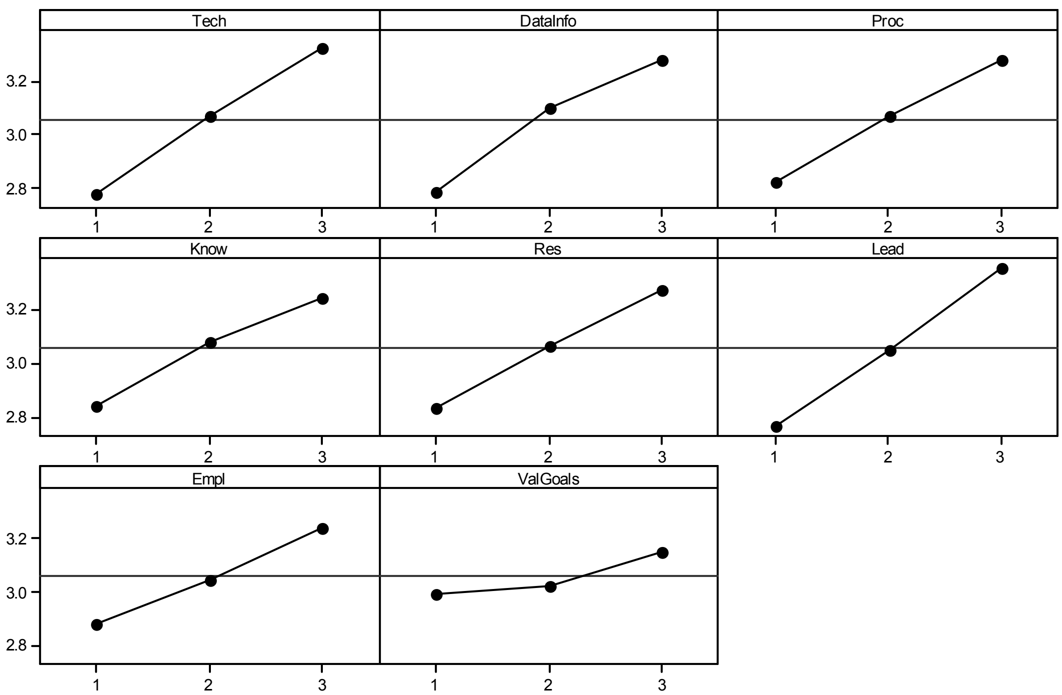

Figure 111. Main Effect Graph (Data Means) for Average (Academics)

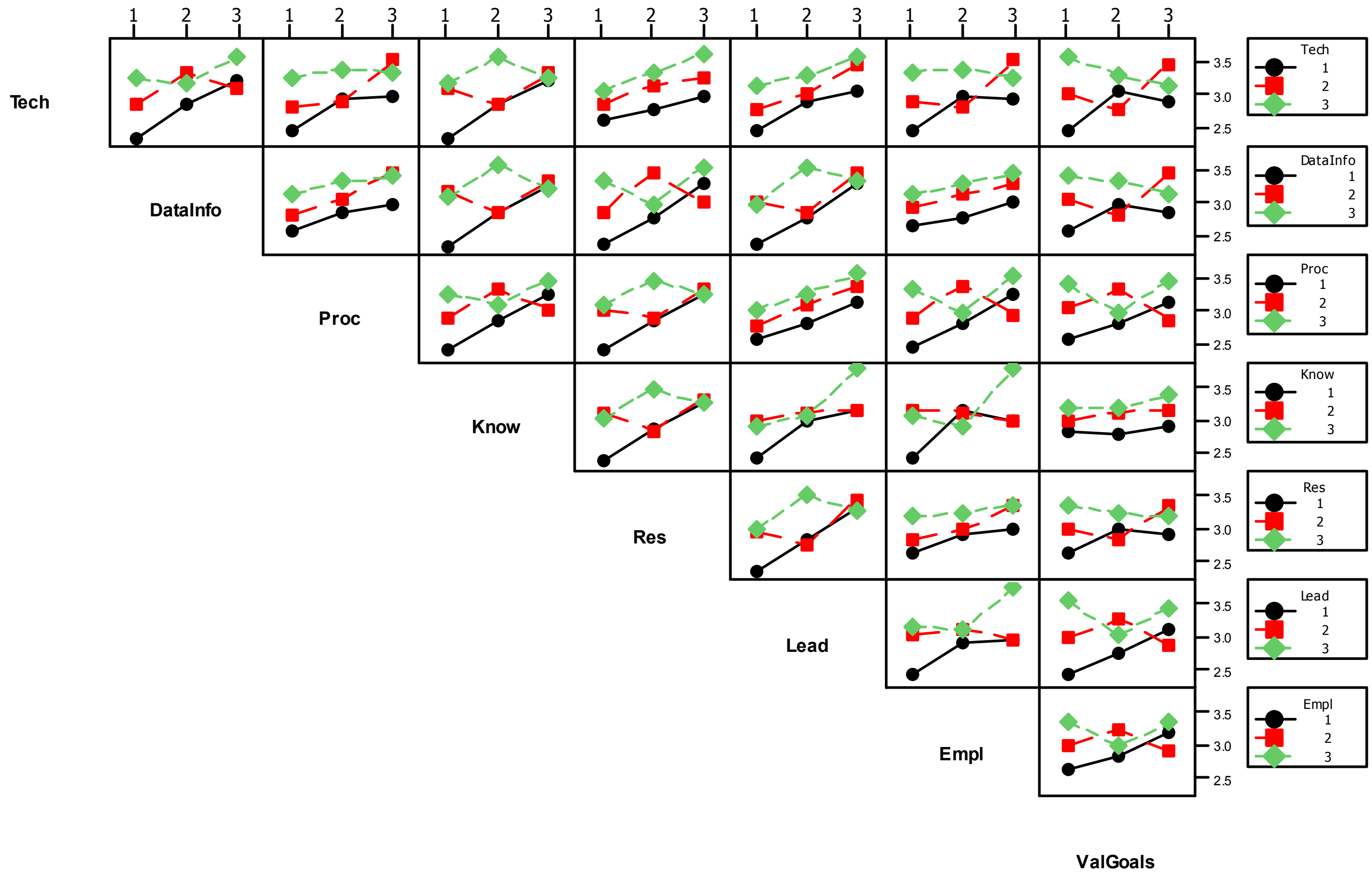

Figure 112. Interaction Graph (Data Means) for Average (Academics)

Analysis of Variance for Average(Acad), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.37189	1.37189	0.68595	75.68	0.000
DataInfo	2	1.11712	1.11712	0.55856	61.62	0.000
Proc	2	0.92071	0.92071	0.46035	50.79	0.000
Know	2	0.73034	0.73034	0.36517	40.29	0.000
Res	2	0.86593	0.86593	0.43297	47.77	0.000
Lead	2	1.54786	1.54786	0.77393	85.39	0.000
Empl	2	0.57834	0.57834	0.28917	31.90	0.000
ValGoals	2	0.12236	0.12236	0.06118	6.75	0.014
Error	10	0.09064	0.09064	0.00906		
Total	26	7.34519				

S = 0.0952050   R-Sq = 98.77%   R-Sq(adj) = 96.79%

Table 134. Avg. and Transformed Response w/ Design Matrix (Industry)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.471	-0.875	1	1	1	1	1	1	1	1
2	2.569	-0.190	1	1	2	1	2	2	3	3
3	3.078	0.034	1	1	3	1	3	3	2	2
4	2.843	-0.068	1	2	1	2	2	3	1	2
5	2.667	-0.146	1	2	2	2	3	1	3	1
6	2.922	-0.034	1	2	3	2	1	2	2	3
7	3.137	0.060	1	3	1	3	3	2	1	3
8	3.412	0.181	1	3	2	3	1	3	3	2
9	2.922	-0.034	1	3	3	3	2	1	2	1
10	2.706	-0.129	2	1	1	2	2	2	2	1
11	3.255	0.111	2	1	2	2	3	3	1	3
12	2.588	-0.181	2	1	3	2	1	1	3	2
13	2.863	-0.060	2	2	1	3	3	1	2	2
14	2.706	-0.129	2	2	2	3	1	2	1	1
15	4.275	0.655	2	2	3	3	2	3	3	3
16	3.157	0.068	2	3	1	1	1	3	2	3
17	2.529	-0.208	2	3	2	1	2	1	1	2
18	3.667	0.301	2	3	3	1	3	2	3	1
19	3.804	0.370	3	1	1	3	3	3	3	1
20	2.784	-0.094	3	1	2	3	1	1	2	3
21	3.216	0.094	3	1	3	3	2	2	1	2
22	2.843	-0.068	3	2	1	1	1	2	3	2
23	3.314	0.137	3	2	2	1	2	3	2	1
24	2.941	-0.026	3	2	3	1	3	1	1	3
25	3.059	0.026	3	3	1	2	2	1	3	3
26	3.863	0.401	3	3	2	2	3	2	2	2
27	3.373	0.164	3	3	3	2	1	3	1	1

Regression equation

```
Average(Ind) = - 0.304 + 0.232 Tech + 0.203 DataInfo + 0.172 Proc + 0.197 Know
               + 0.223 Res + 0.371 Lead + 0.190 Empl + 0.0816 ValGoals
```

Predictor	Coef	SE Coef	T	P
Constant	-0.3044	0.1550	-1.96	0.065
Tech	0.23200	0.02712	8.55	0.000
DataInfo	0.20267	0.02712	7.47	0.000
Proc	0.17217	0.02712	6.35	0.000
Know	0.19722	0.02712	7.27	0.000
Res	0.22328	0.02712	8.23	0.000
Lead	0.37150	0.02712	13.70	0.000
Empl	0.18961	0.02712	6.99	0.000
ValGoals	0.08161	0.02712	3.01	0.008

S = 0.115057   R-Sq = 96.7%   R-Sq(adj) = 95.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.09045	0.88631	66.95	0.000
Residual Error	18	0.23829	0.01324		
Total	26	7.32873			

Regression equation

```
z (Ind) = - 1.70 + 0.115 Tech + 0.101 DataInfo + 0.0916 Proc + 0.104 Know
          + 0.112 Res + 0.181 Lead + 0.101 Empl + 0.0509 ValGoals
```

Predictor	Coef	SE Coef	T	P
Constant	-1.69989	0.08214	-20.70	0.000
Tech	0.11533	0.01437	8.03	0.000
DataInfo	0.10106	0.01437	7.03	0.000
Proc	0.09161	0.01437	6.37	0.000
Know	0.10389	0.01437	7.23	0.000
Res	0.11183	0.01437	7.78	0.000
Lead	0.18056	0.01437	12.56	0.000
Empl	0.10139	0.01437	7.05	0.000
ValGoals	0.05094	0.01437	3.54	0.002

S = 0.0609727   R-Sq = 96.4%   R-Sq(adj) = 94.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.81227	0.22653	60.93	0.000
Residual Error	18	0.06692	0.00372		
Total	26	1.87919			

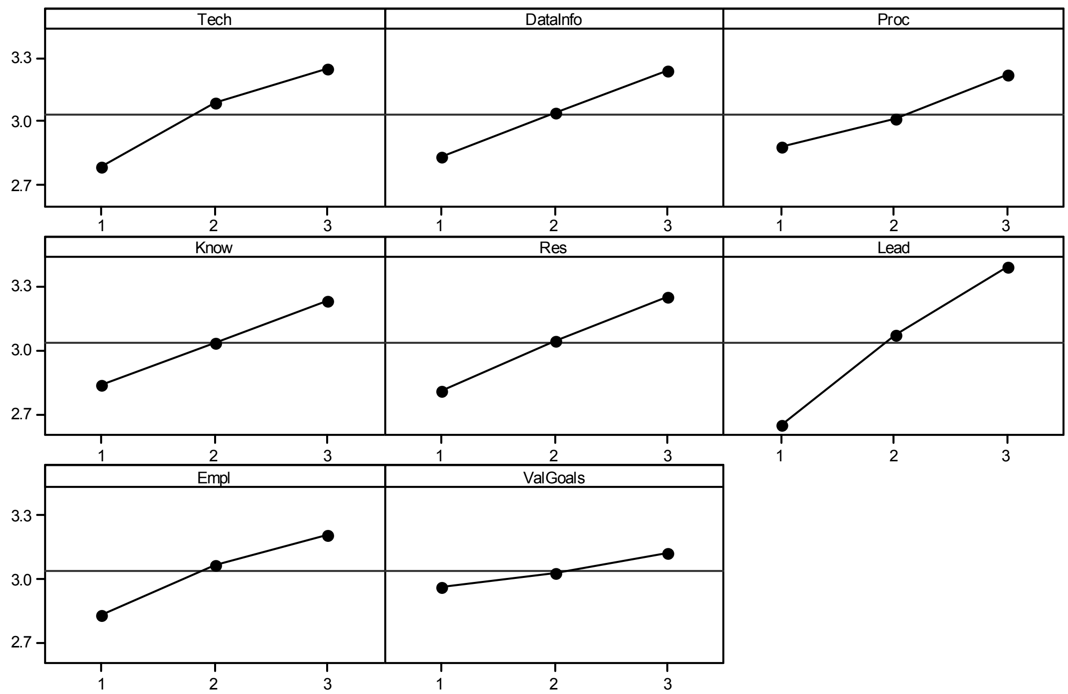

Figure 113. Main Effect Graph (Data Means) for Average Response (Industry)

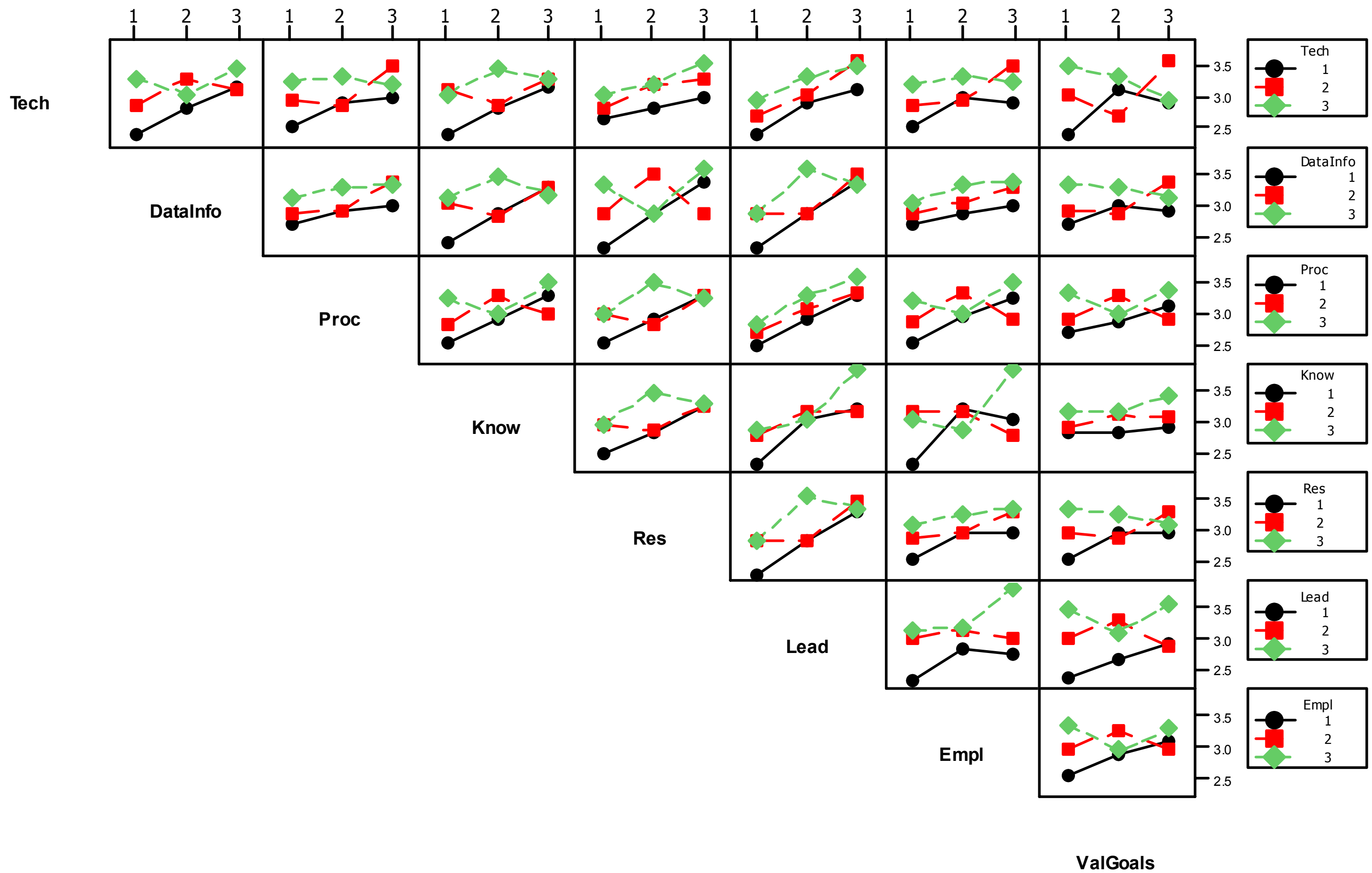

Figure 114. Interaction Graph for Sample Segments (Industry)

Analysis of Variance for Average(Ind), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	0.99889	0.99889	0.49944	30.03	0.000
DataInfo	2	0.73979	0.73979	0.36990	22.24	0.000
Proc	2	0.54178	0.54178	0.27089	16.29	0.001
Know	2	0.70048	0.70048	0.35024	21.06	0.000
Res	2	0.89943	0.89943	0.44972	27.04	0.000
Lead	2	2.50000	2.50000	1.25000	75.17	0.000
Empl	2	0.66093	0.66093	0.33047	19.87	0.000
ValGoals	2	0.12113	0.12113	0.06056	3.64	0.065
Error	10	0.16630	0.16630	0.01663		
Total	26	7.32873				

S = 0.128956   R-Sq = 97.73%   R-Sq(adj) = 94.10%

Table 135. Avg. and Transformed Response w/ Design Matrix (US)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.492	-0.853	1	1	1	1	1	1	1	1
2	2.525	-0.210	1	1	2	1	2	2	3	3
3	2.984	-0.007	1	1	3	1	3	3	2	2
4	2.787	-0.093	1	2	1	2	2	3	1	2
5	2.672	-0.144	1	2	2	2	3	1	3	1
6	2.918	-0.036	1	2	3	2	1	2	2	3
7	3.082	0.036	1	3	1	3	3	2	1	3
8	3.426	0.188	1	3	2	3	1	3	3	2
9	2.869	-0.057	1	3	3	3	2	1	2	1
10	2.656	-0.151	2	1	1	2	2	2	2	1
11	3.213	0.093	2	1	2	2	3	3	1	3
12	2.574	-0.188	2	1	3	2	1	1	3	2
13	2.803	-0.086	2	2	1	3	3	1	2	2
14	2.738	-0.115	2	2	2	3	1	2	1	1
15	4.164	0.578	2	2	3	3	2	3	3	3
16	3.033	0.014	2	3	1	1	1	3	2	3
17	2.475	-0.233	2	3	2	1	2	1	1	2
18	3.525	0.233	2	3	3	1	3	2	3	1
19	3.607	0.272	3	1	1	3	3	3	3	1
20	2.623	-0.166	3	1	2	3	1	1	2	3
21	3.131	0.057	3	1	3	3	2	2	1	2
22	2.738	-0.115	3	2	1	1	1	2	3	2
23	3.311	0.136	3	2	2	1	2	3	2	1
24	2.951	-0.021	3	2	3	1	3	1	1	3
25	3.000	0.000	3	3	1	2	2	1	3	3
26	3.721	0.328	3	3	2	2	3	2	2	2
27	3.328	0.144	3	3	3	2	1	3	1	1

Regression equation

Average(US) = - 0.179 + 0.203 Tech + 0.203 DataInfo + 0.180 Proc + 0.189 Know + 0.205 Res + 0.355 Lead + 0.169 Empl + 0.0728 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.1788	0.1359	-1.32	0.205
Tech	0.20306	0.02378	8.54	0.000
DataInfo	0.20300	0.02378	8.54	0.000
Proc	0.18033	0.02378	7.58	0.000
Know	0.18939	0.02378	7.96	0.000
Res	0.20489	0.02378	8.62	0.000
Lead	0.35522	0.02378	14.94	0.000
Empl	0.16856	0.02378	7.09	0.000
ValGoals	0.07283	0.02378	3.06	0.007

S = 0.100890   R-Sq = 97.2%   R-Sq(adj) = 95.9%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	6.34872	0.79359	77.96	0.000
Residual Error	18	0.18322	0.01018		
Total	26	6.53194			

Regression equation

z (US) = - 1.61 + 0.101 Tech + 0.100 DataInfo + 0.0933 Proc + 0.0979 Know + 0.102 Res + 0.171 Lead + 0.0888 Empl + 0.0457 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.61300	0.07015	-22.99	0.000
Tech	0.10061	0.01227	8.20	0.000
DataInfo	0.10033	0.01227	8.17	0.000
Proc	0.09328	0.01227	7.60	0.000
Know	0.09794	0.01227	7.98	0.000
Res	0.10172	0.01227	8.29	0.000
Lead	0.17072	0.01227	13.91	0.000
Empl	0.08883	0.01227	7.24	0.000
ValGoals	0.04572	0.01227	3.73	0.002

S = 0.0520732   R-Sq = 97.0%   R-Sq(adj) = 95.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.58325	0.19791	72.98	0.000
Residual Error	18	0.04881	0.00271		
Total	26	1.63206			

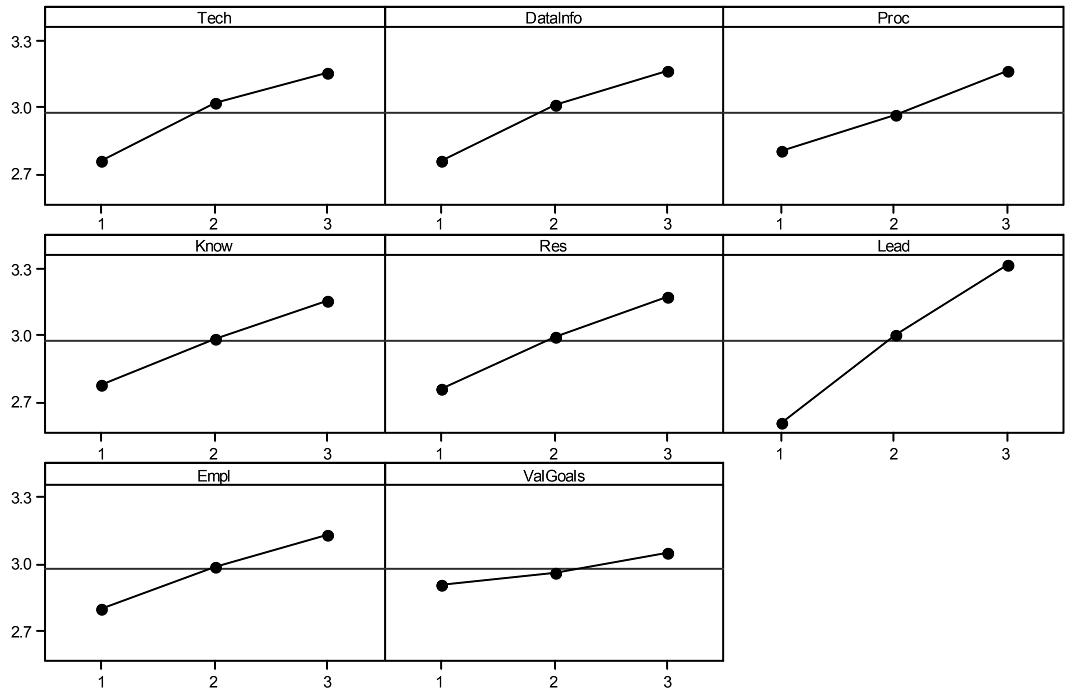

Figure 115. Main Effect Graph for Sample Segments (US)

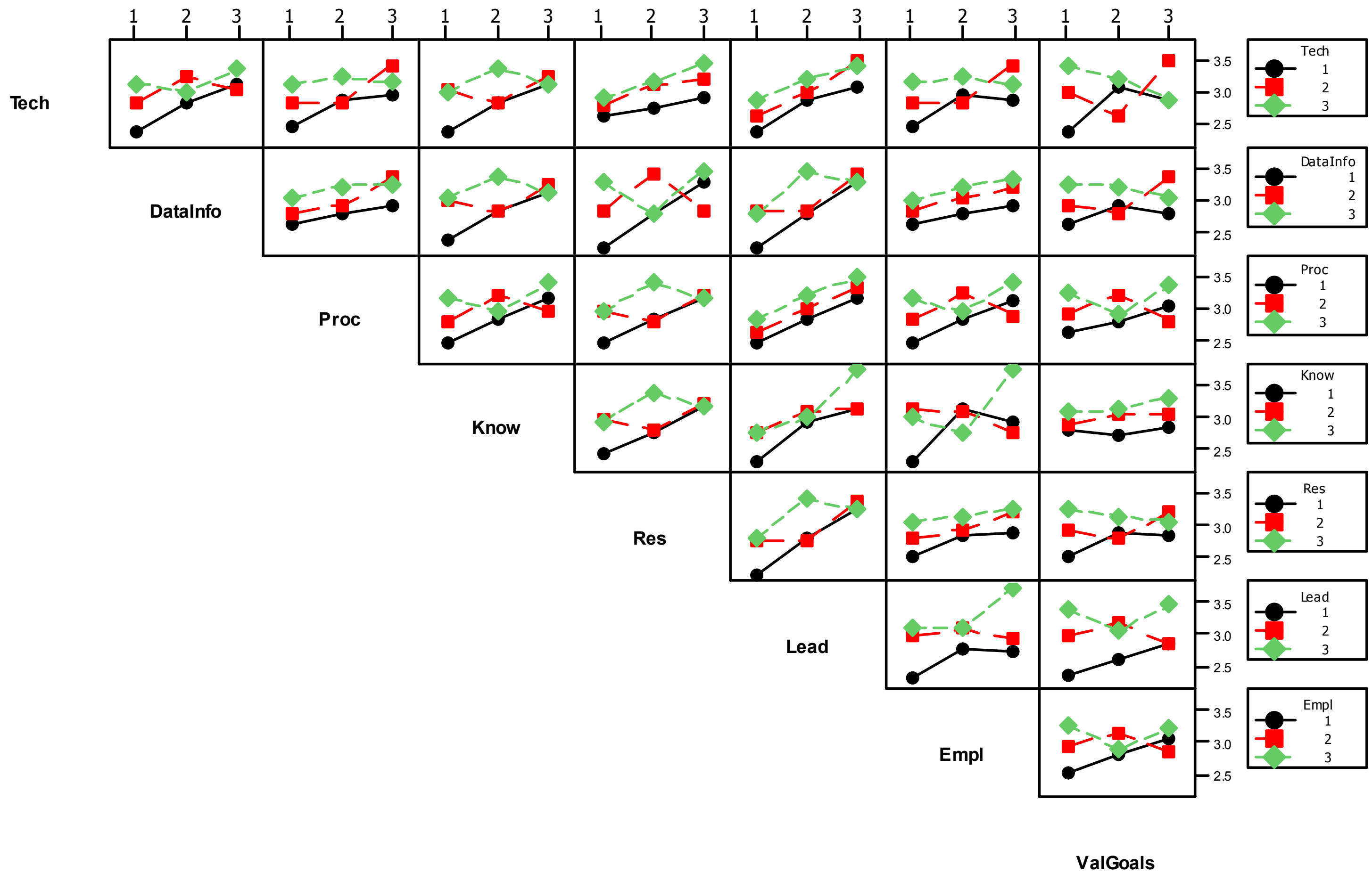

Figure 116. Interaction Graph for Sample Segments (US)

Analysis of Variance for Average(US), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	0.76870	0.76870	0.38435	32.23	0.000
DataInfo	2	0.75676	0.75676	0.37838	31.73	0.000
Proc	2	0.58638	0.58638	0.29319	24.59	0.000
Know	2	0.64689	0.64689	0.32344	27.12	0.000
Res	2	0.75871	0.75871	0.37936	31.81	0.000
Lead	2	2.28187	2.28187	1.14094	95.67	0.000
Empl	2	0.51448	0.51448	0.25724	21.57	0.000
ValGoals	2	0.09889	0.09889	0.04945	4.15	0.049
Error	10	0.11925	0.11925	0.01193		
Total	26	6.53194				

S = 0.109203   R-Sq = 98.17%   R-Sq(adj) = 95.25%

Table 136. Avg. and Transformed Response w/ Design Matrix (Global)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.396	-0.959	1	1	1	1	1	1	1	1
2	2.583	-0.184	1	1	2	1	2	2	3	3
3	3.042	0.018	1	1	3	1	3	3	2	2
4	2.729	-0.118	1	2	1	2	2	3	1	2
5	2.875	-0.054	1	2	2	2	3	1	3	1
6	2.958	-0.018	1	2	3	2	1	2	2	3
7	3.208	0.091	1	3	1	3	3	2	1	3
8	3.417	0.184	1	3	2	3	1	3	3	2
9	3.083	0.036	1	3	3	3	2	1	2	1
10	2.542	-0.203	2	1	1	2	2	2	2	1
11	3.250	0.109	2	1	2	2	3	3	1	3
12	2.813	-0.082	2	1	3	2	1	1	3	2
13	2.979	-0.009	2	2	1	3	3	1	2	2
14	2.813	-0.082	2	2	2	3	1	2	1	1
15	4.333	0.699	2	2	3	3	2	3	3	3
16	3.083	0.036	2	3	1	1	1	3	2	3
17	2.708	-0.128	2	3	2	1	2	1	1	2
18	3.771	0.353	2	3	3	1	3	2	3	1
19	3.917	0.430	3	1	1	3	3	3	3	1
20	3.000	0.000	3	1	2	3	1	1	2	3
21	3.313	0.137	3	1	3	3	2	2	1	2
22	2.896	-0.045	3	2	1	1	1	2	3	2
23	3.500	0.222	3	2	2	1	2	3	2	1
24	3.292	0.128	3	2	3	1	3	1	1	3
25	3.438	0.193	3	3	1	2	2	1	3	3
26	4.063	0.514	3	3	2	2	3	2	2	2
27	3.667	0.301	3	3	3	2	1	3	1	1

Regression equation

```
Average(Global) = - 0.554 + 0.322 Tech + 0.255 DataInfo + 0.227 Proc
                  + 0.211 Know + 0.242 Res + 0.297 Lead + 0.204 Empl
                  + 0.0878 ValGoals
```

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.5540	0.1160	-4.78	0.000
Tech	0.32194	0.02029	15.87	0.000
DataInfo	0.25456	0.02029	12.54	0.000
Proc	0.22689	0.02029	11.18	0.000
Know	0.21067	0.02029	10.38	0.000
Res	0.24189	0.02029	11.92	0.000
Lead	0.29744	0.02029	14.66	0.000
Empl	0.20372	0.02029	10.04	0.000
ValGoals	0.08783	0.02029	4.33	0.000

S = 0.0860914   R-Sq = 98.4%   R-Sq(adj) = 97.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	8.2891	1.0361	139.80	0.000
Residual Error	18	0.1334	0.0074		
Total	26	8.4225			

Regression equation

```
z (Global) = - 1.88 + 0.160 Tech + 0.129 DataInfo + 0.120 Proc + 0.114 Know
             + 0.125 Res + 0.153 Lead + 0.112 Empl + 0.0561 ValGoals
```

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.87800	0.07089	-26.49	0.000
Tech	0.16022	0.01240	12.92	0.000
DataInfo	0.12856	0.01240	10.36	0.000
Proc	0.11978	0.01240	9.66	0.000
Know	0.11361	0.01240	9.16	0.000
Res	0.12472	0.01240	10.06	0.000
Lead	0.15311	0.01240	12.34	0.000
Empl	0.11194	0.01240	9.03	0.000
ValGoals	0.05611	0.01240	4.52	0.000

S = 0.0526248   R-Sq = 97.8%   R-Sq(adj) = 96.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	2.23435	0.27929	100.85	0.000
Residual Error	18	0.04985	0.00277		
Total	26	2.28420			

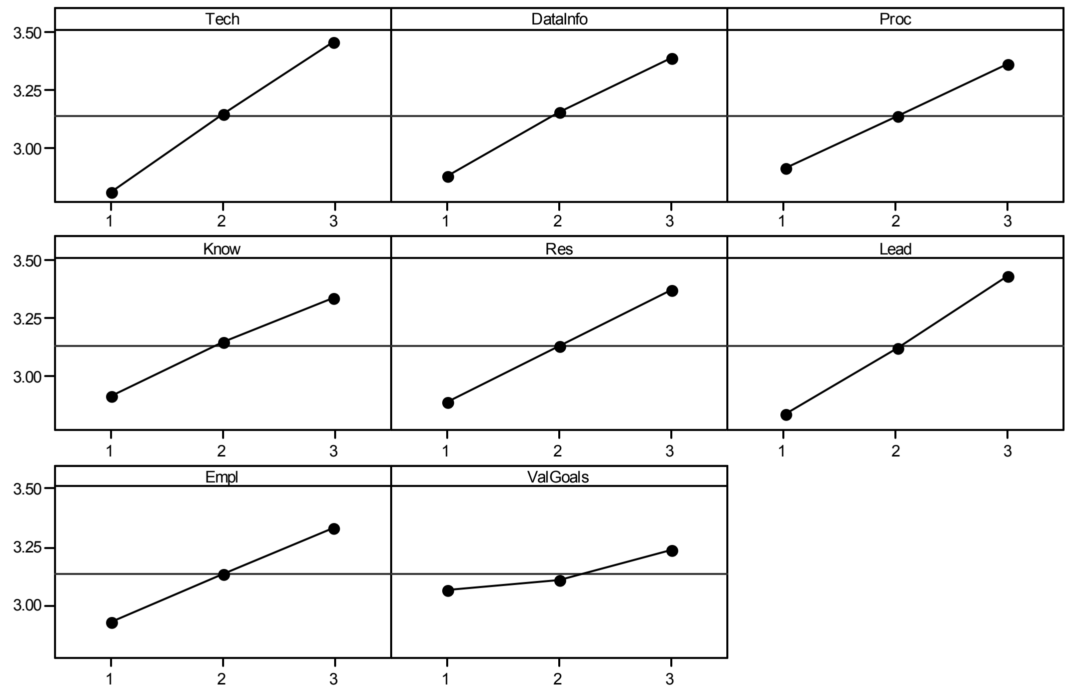

Figure 117. Main Effect Graph for Sample Segments (Global)

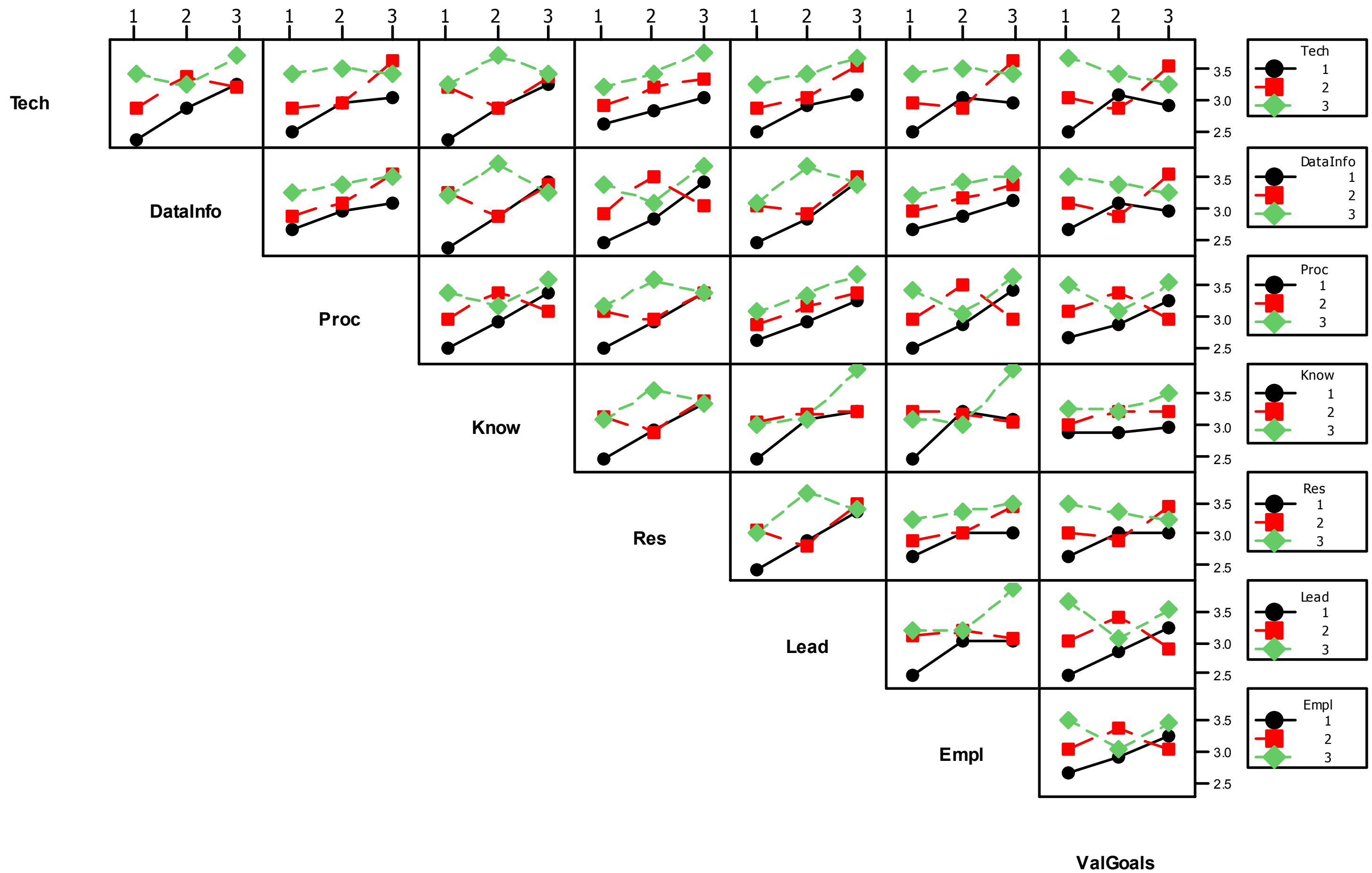

Figure 118. Interaction Graph for Sample Segments (Global)

Analysis of Variance for Average(Global), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.86646	1.86646	0.93323	81.84	0.000
DataInfo	2	1.17022	1.17022	0.58511	51.31	0.000
Proc	2	0.92665	0.92665	0.46332	40.63	0.000
Know	2	0.80094	0.80094	0.40047	35.12	0.000
Res	2	1.05319	1.05319	0.52660	46.18	0.000
Lead	2	1.59348	1.59348	0.79674	69.87	0.000
Empl	2	0.74717	0.74717	0.37359	32.76	0.000
ValGoals	2	0.15039	0.15039	0.07520	6.59	0.015
Error	10	0.11403	0.11403	0.01140		
Total	26	8.42253				

S = 0.106783   R-Sq = 98.65%   R-Sq(adj) = 96.48%

Table 137. Avg. and Transformed Response w/ Design Matrix (Small)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.434	-0.915	1	1	1	1	1	1	1	1
2	2.566	-0.192	1	1	2	1	2	2	3	3
3	2.925	-0.033	1	1	3	1	3	3	2	2
4	2.774	-0.099	1	2	1	2	2	3	1	2
5	2.604	-0.174	1	2	2	2	3	1	3	1
6	2.943	-0.025	1	2	3	2	1	2	2	3
7	3.113	0.049	1	3	1	3	3	2	1	3
8	3.528	0.235	1	3	2	3	1	3	3	2
9	2.962	-0.016	1	3	3	3	2	1	2	1
10	2.604	-0.174	2	1	1	2	2	2	2	1
11	3.321	0.141	2	1	2	2	3	3	1	3
12	2.755	-0.107	2	1	3	2	1	1	3	2
13	2.830	-0.074	2	2	1	3	3	1	2	2
14	2.717	-0.124	2	2	2	3	1	2	1	1
15	4.321	0.689	2	2	3	3	2	3	3	3
16	3.113	0.049	2	3	1	1	1	3	2	3
17	2.566	-0.192	2	3	2	1	2	1	1	2
18	3.679	0.307	2	3	3	1	3	2	3	1
19	3.717	0.326	3	1	1	3	3	3	3	1
20	2.811	-0.082	3	1	2	3	1	1	2	3
21	3.264	0.115	3	1	3	3	2	2	1	2
22	2.792	-0.090	3	2	1	1	1	2	3	2
23	3.396	0.174	3	2	2	1	2	3	2	1
24	3.019	0.008	3	2	3	1	3	1	1	3
25	3.132	0.057	3	3	1	2	2	1	3	3
26	3.755	0.345	3	3	2	2	3	2	2	2
27	3.491	0.217	3	3	3	2	1	3	1	1

Regression equation

Average(Sml) = - 0.411 + 0.252 Tech + 0.219 DataInfo + 0.214 Proc + 0.210 Know + 0.188 Res + 0.360 Lead + 0.189 Empl + 0.0964 ValGoals

Predictor	Coef	SE Coef	T	P
Constant	-0.4109	0.1424	-2.88	0.010
Tech	0.25156	0.02492	10.09	0.000
DataInfo	0.21900	0.02492	8.79	0.000
Proc	0.21389	0.02492	8.58	0.000
Know	0.20961	0.02492	8.41	0.000
Res	0.18772	0.02492	7.53	0.000
Lead	0.35961	0.02492	14.43	0.000
Empl	0.18861	0.02492	7.57	0.000
ValGoals	0.09639	0.02492	3.87	0.001

S = 0.105738   R-Sq = 97.3%   R-Sq(adj) = 96.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.38632	0.92329	82.58	0.000
Residual Error	18	0.20125	0.01118		
Total	26	7.58757			

Regression equation

z (Sml) = - 1.77 + 0.124 Tech + 0.110 DataInfo + 0.113 Proc + 0.111 Know + 0.0965 Res + 0.177 Lead + 0.103 Empl + 0.0596 ValGoals

Predictor	Coef	SE Coef	T	P
Constant	-1.77296	0.07641	-23.20	0.000
Tech	0.12444	0.01337	9.31	0.000
DataInfo	0.10956	0.01337	8.19	0.000
Proc	0.11256	0.01337	8.42	0.000
Know	0.11122	0.01337	8.32	0.000
Res	0.09650	0.01337	7.22	0.000
Lead	0.17744	0.01337	13.27	0.000
Empl	0.10283	0.01337	7.69	0.000
ValGoals	0.05961	0.01337	4.46	0.000

S = 0.0567232   R-Sq = 97.1%   R-Sq(adj) = 95.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.93419	0.24177	75.14	0.000
Residual Error	18	0.05792	0.00322		
Total	26	1.99210			

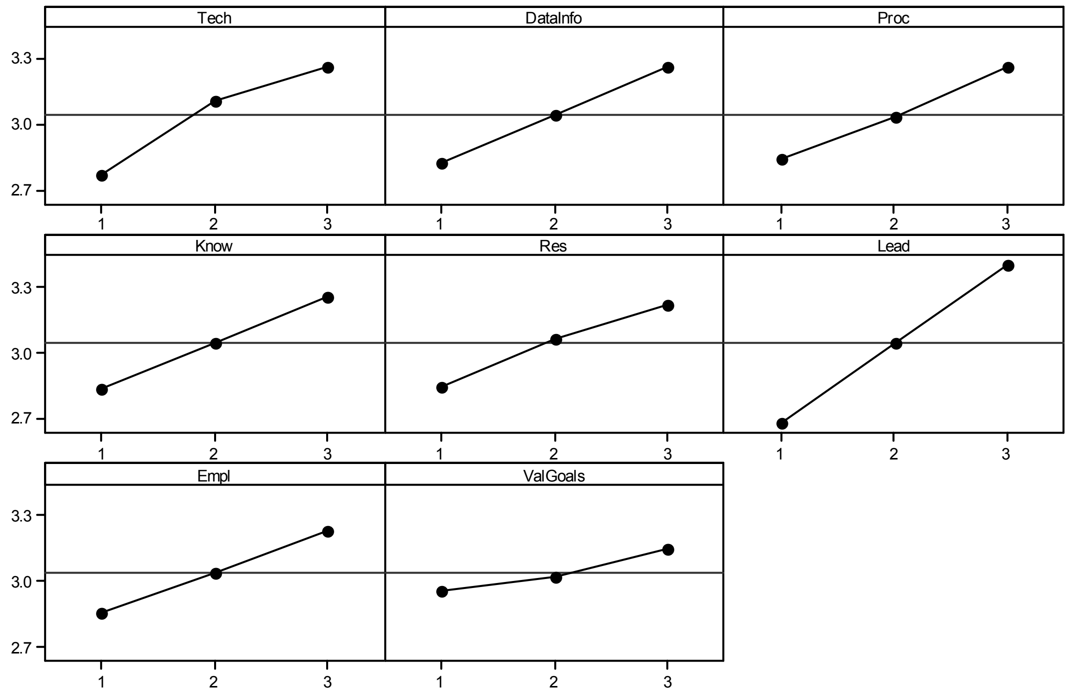

Figure 119. Main Effect Graph for Sample Segments (Small)

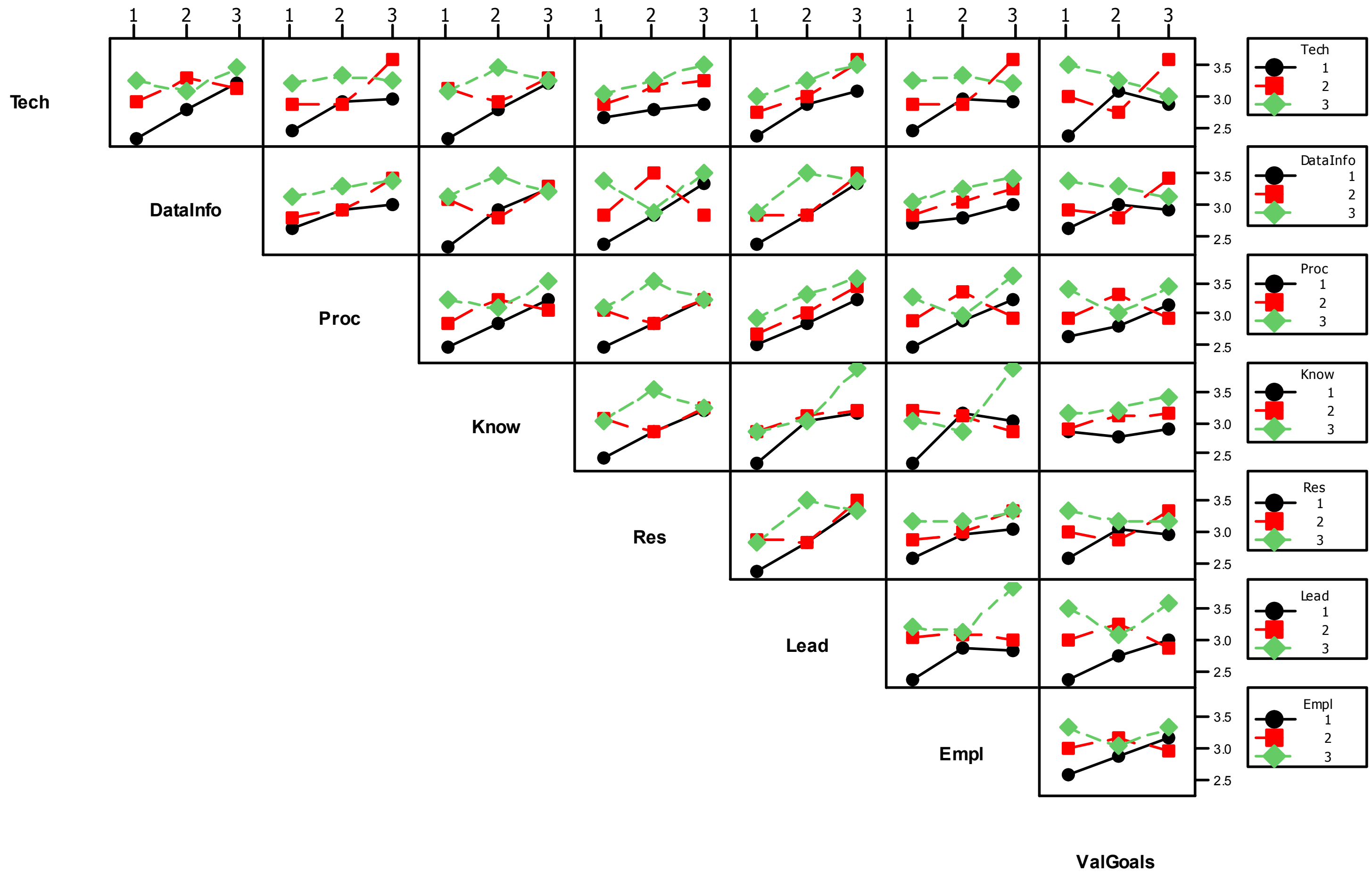

Figure 120. Interaction Graph for Sample Segments (Small)

Analysis of Variance for Average(Sml), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.18562	1.18562	0.59281	42.77	0.000
DataInfo	2	0.86336	0.86336	0.43168	31.14	0.000
Proc	2	0.82561	0.82561	0.41281	29.78	0.000
Know	2	0.79086	0.79086	0.39543	28.53	0.000
Res	2	0.64150	0.64150	0.32075	23.14	0.000
Lead	2	2.32828	2.32828	1.16414	83.99	0.000
Empl	2	0.64058	0.64058	0.32029	23.11	0.000
ValGoals	2	0.17315	0.17315	0.08657	6.25	0.017
Error	10	0.13861	0.13861	0.01386		
Total	26	7.58757				

S = 0.117731   R-Sq = 98.17%   R-Sq(adj) = 95.25%

Table 138. Avg. and Transformed Response w/ Design Matrix (Large)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.464	-0.882	1	1	1	1	1	1	1	1
2	2.536	-0.205	1	1	2	1	2	2	3	3
3	3.089	0.039	1	1	3	1	3	3	2	2
4	2.750	-0.109	1	2	1	2	2	3	1	2
5	2.911	-0.039	1	2	2	2	3	1	3	1
6	2.929	-0.031	1	2	3	2	1	2	2	3
7	3.161	0.070	1	3	1	3	3	2	1	3
8	3.321	0.141	1	3	2	3	1	3	3	2
9	2.964	-0.016	1	3	3	3	2	1	2	1
10	2.607	-0.173	2	1	1	2	2	2	2	1
11	3.143	0.062	2	1	2	2	3	3	1	3
12	2.607	-0.173	2	1	3	2	1	1	3	2
13	2.929	-0.031	2	2	1	3	3	1	2	2
14	2.821	-0.078	2	2	2	3	1	2	1	1
15	4.161	0.576	2	2	3	3	2	3	3	3
16	3.000	0.000	2	3	1	1	1	3	2	3
17	2.589	-0.181	2	3	2	1	2	1	1	2
18	3.589	0.264	2	3	3	1	3	2	3	1
19	3.768	0.351	3	1	1	3	3	3	3	1
20	2.768	-0.101	3	1	2	3	1	1	2	3
21	3.161	0.070	3	1	3	3	2	2	1	2
22	2.821	-0.078	3	2	1	1	1	2	3	2
23	3.393	0.173	3	2	2	1	2	3	2	1
24	3.179	0.078	3	2	3	1	3	1	1	3
25	3.250	0.109	3	3	1	2	2	1	3	3
26	3.982	0.467	3	3	2	2	3	2	2	2
27	3.464	0.205	3	3	3	2	1	3	1	1

Regression equation

Average(Large) = -0.282 + 0.259 Tech + 0.232 DataInfo + 0.188 Proc + 0.189 Know + 0.253 Res + 0.302 Lead + 0.180 Empl + 0.0637 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.2816	0.1352	-2.08	0.052
Tech	0.25894	0.02366	10.94	0.000
DataInfo	0.23206	0.02366	9.81	0.000
Proc	0.18850	0.02366	7.97	0.000
Know	0.18856	0.02366	7.97	0.000
Res	0.25311	0.02366	10.70	0.000
Lead	0.30156	0.02366	12.75	0.000
Empl	0.17956	0.02366	7.59	0.000
ValGoals	0.06367	0.02366	2.69	0.015

S = 0.100379   R-Sq = 97.4%   R-Sq(adj) = 96.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	6.89908	0.86238	85.59	0.000
Residual Error	18	0.18137	0.01008		
Total	26	7.08044			

Regression equation

z (Lg) = - 1.68 + 0.128 Tech + 0.115 DataInfo + 0.0975 Proc + 0.0986 Know + 0.125 Res + 0.149 Lead + 0.0951 Empl + 0.0418 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.68141	0.07406	-22.70	0.000
Tech	0.12811	0.01296	9.89	0.000
DataInfo	0.11506	0.01296	8.88	0.000
Proc	0.09750	0.01296	7.52	0.000
Know	0.09856	0.01296	7.61	0.000
Res	0.12544	0.01296	9.68	0.000
Lead	0.14856	0.01296	11.46	0.000
Empl	0.09506	0.01296	7.34	0.000
ValGoals	0.04183	0.01296	3.23	0.005

S = 0.0549748   R-Sq = 97.0%   R-Sq(adj) = 95.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.75429	0.21929	72.56	0.000
Residual Error	18	0.05440	0.00302		
Total	26	1.80869			

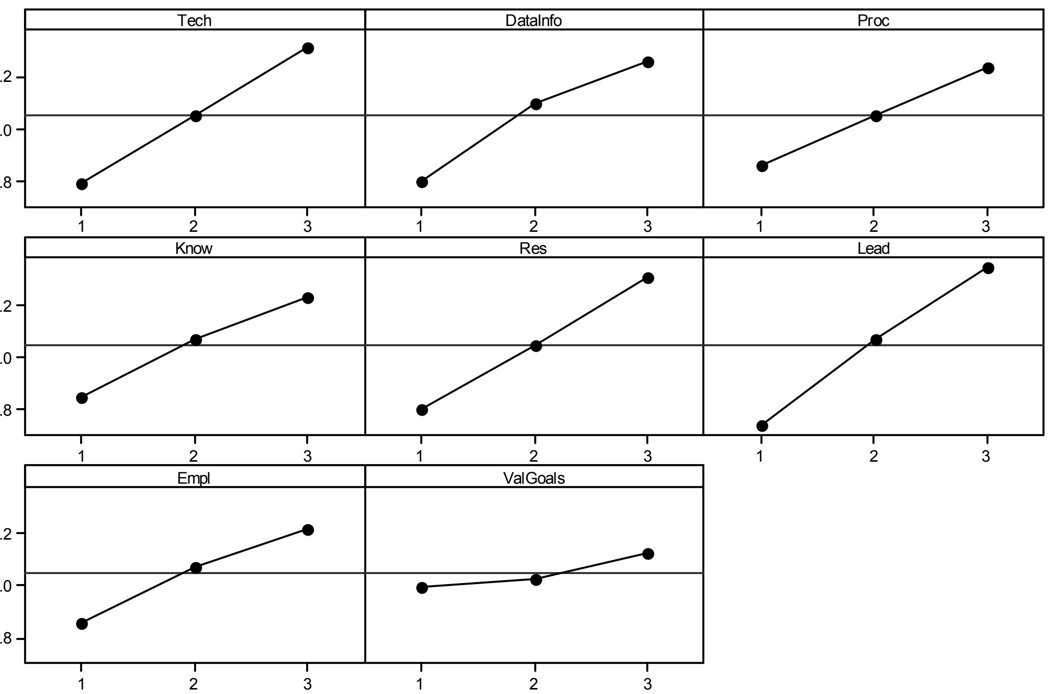

Figure 121. Main Effect Graph for Sample Segments (Large)

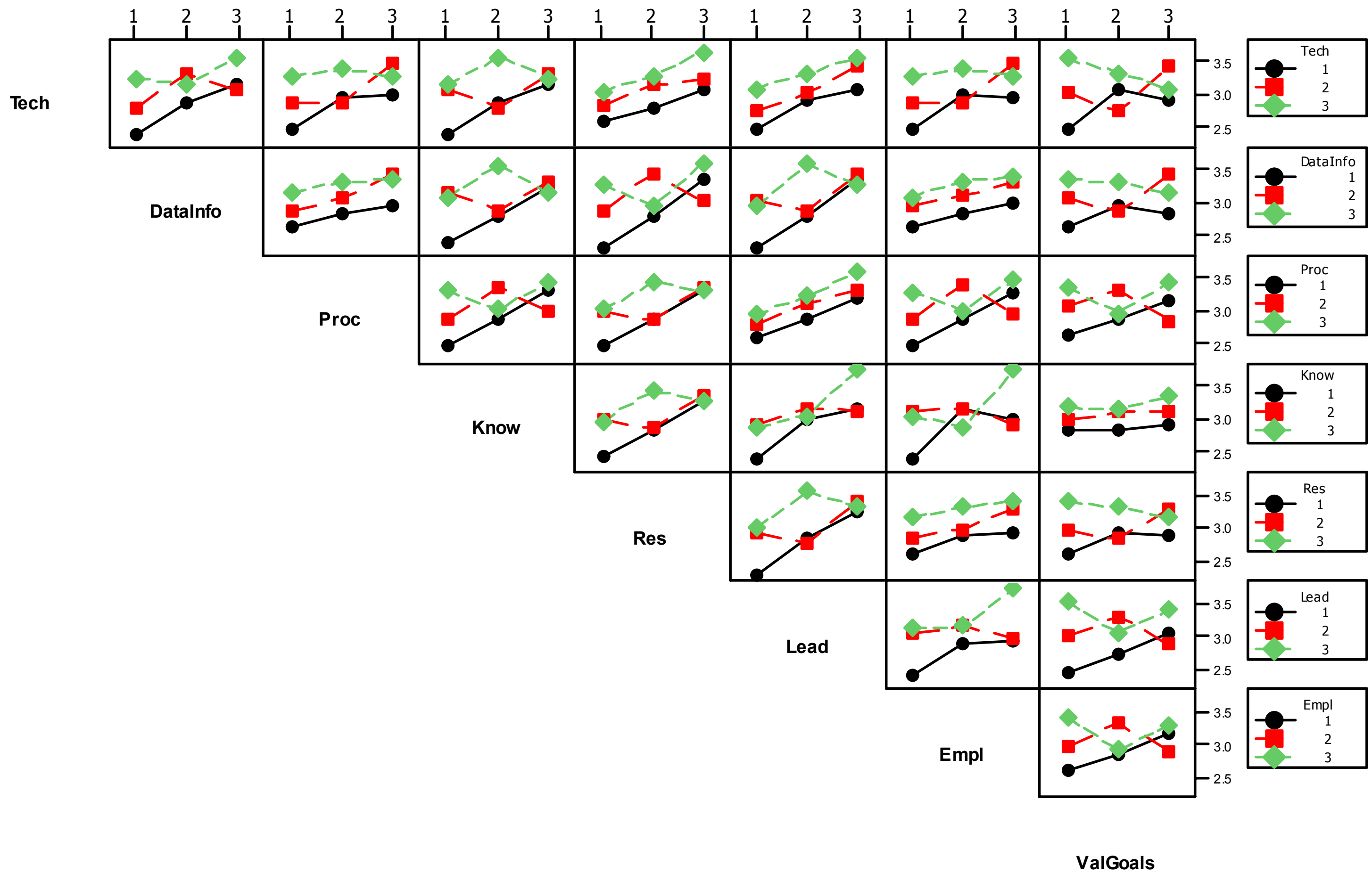

Figure 122. Interaction Graph for Sample Segments (Large)

Analysis of Variance for Average(Large), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.20695	1.20695	0.60347	48.53	0.000
DataInfo	2	1.00181	1.00181	0.50090	40.28	0.000
Proc	2	0.63960	0.63960	0.31980	25.72	0.000
Know	2	0.64602	0.64602	0.32301	25.98	0.000
Res	2	1.15346	1.15346	0.57673	46.38	0.000
Lead	2	1.64083	1.64083	0.82042	65.98	0.000
Empl	2	0.58758	0.58758	0.29379	23.63	0.000
ValGoals	2	0.07985	0.07985	0.03993	3.21	0.084
Error	10	0.12435	0.12435	0.01243		
Total	26	7.08044				

S = 0.111511   R-Sq = 98.24%   R-Sq(adj) = 95.43%

Table 139. Avg. and Transformed Response w/ Design Matrix (Mobile ICT)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.420	-0.931	1	1	1	1	1	1	1	1
2	2.481	-0.230	1	1	2	1	2	2	3	3
3	3.000	0.000	1	1	3	1	3	3	2	2
4	2.778	-0.097	1	2	1	2	2	3	1	2
5	2.778	-0.097	1	2	2	2	3	1	3	1
6	2.926	-0.032	1	2	3	2	1	2	2	3
7	3.099	0.043	1	3	1	3	3	2	1	3
8	3.395	0.174	1	3	2	3	1	3	3	2
9	2.975	-0.011	1	3	3	3	2	1	2	1
10	2.704	-0.130	2	1	1	2	2	2	2	1
11	3.235	0.102	2	1	2	2	3	3	1	3
12	2.642	-0.157	2	1	3	2	1	1	3	2
13	2.889	-0.048	2	2	1	3	3	1	2	2
14	2.753	-0.108	2	2	2	3	1	2	1	1
15	4.185	0.592	2	2	3	3	2	3	3	3
16	2.975	-0.011	2	3	1	1	1	3	2	3
17	2.593	-0.179	2	3	2	1	2	1	1	2
18	3.617	0.277	2	3	3	1	3	2	3	1
19	3.753	0.344	3	1	1	3	3	3	3	1
20	2.815	-0.081	3	1	2	3	1	1	2	3
21	3.210	0.091	3	1	3	3	2	2	1	2
22	2.815	-0.081	3	2	1	1	1	2	3	2
23	3.358	0.157	3	2	2	1	2	3	2	1
24	3.123	0.054	3	2	3	1	3	1	1	3
25	3.185	0.081	3	3	1	2	2	1	3	3
26	3.901	0.422	3	3	2	2	3	2	2	2
27	3.469	0.208	3	3	3	2	1	3	1	1

Regression equation

Average(M-yes) = -0.319 + 0.265 Tech + 0.219 DataInfo + 0.196 Proc + 0.205 Know + 0.233 Res + 0.318 Lead + 0.176 Empl + 0.0665 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.3189	0.1272	-2.51	0.022
Tech	0.26539	0.02226	11.92	0.000
DataInfo	0.21939	0.02226	9.85	0.000
Proc	0.19606	0.02226	8.81	0.000
Know	0.20511	0.02226	9.21	0.000
Res	0.23250	0.02226	10.44	0.000
Lead	0.31822	0.02226	14.29	0.000
Empl	0.17617	0.02226	7.91	0.000
ValGoals	0.06650	0.02226	2.99	0.008

S = 0.0944583   R-Sq = 97.8%   R-Sq(adj) = 96.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.01729	0.87716	98.31	0.000
Residual Error	18	0.16060	0.00892		
Total	26	7.17790			

Regression equation

z (M-yes) = - 1.73 + 0.132 Tech + 0.111 DataInfo + 0.103 Proc + 0.108 Know + 0.118 Res + 0.158 Lead + 0.0956 Empl + 0.0449 ValGoals

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.72552	0.07522	-22.94	0.000
Tech	0.13200	0.01316	10.03	0.000
DataInfo	0.11089	0.01316	8.43	0.000
Proc	0.10289	0.01316	7.82	0.000
Know	0.10778	0.01316	8.19	0.000
Res	0.11756	0.01316	8.93	0.000
Lead	0.15767	0.01316	11.98	0.000
Empl	0.09556	0.01316	7.26	0.000
ValGoals	0.04494	0.01316	3.41	0.003

S = 0.0558383   R-Sq = 97.0%   R-Sq(adj) = 95.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.83153	0.22894	73.43	0.000
Residual Error	18	0.05612	0.00312		
Total	26	1.88765			

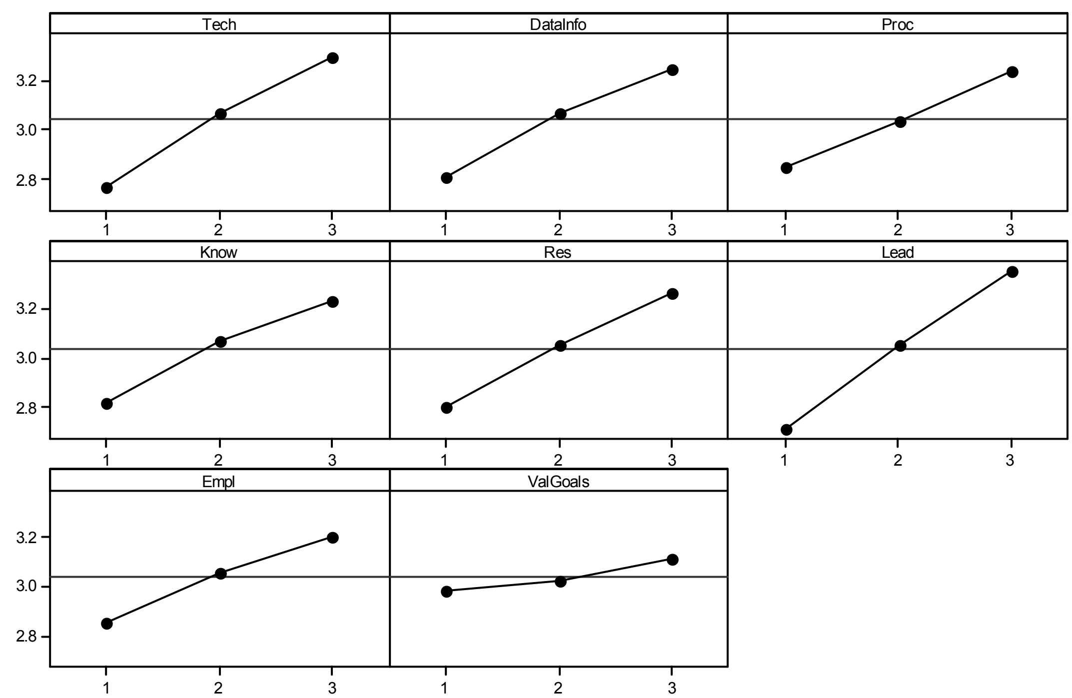

Figure 123. Main Effect Graph for Sample Segments (Mobile ICT Deployed)

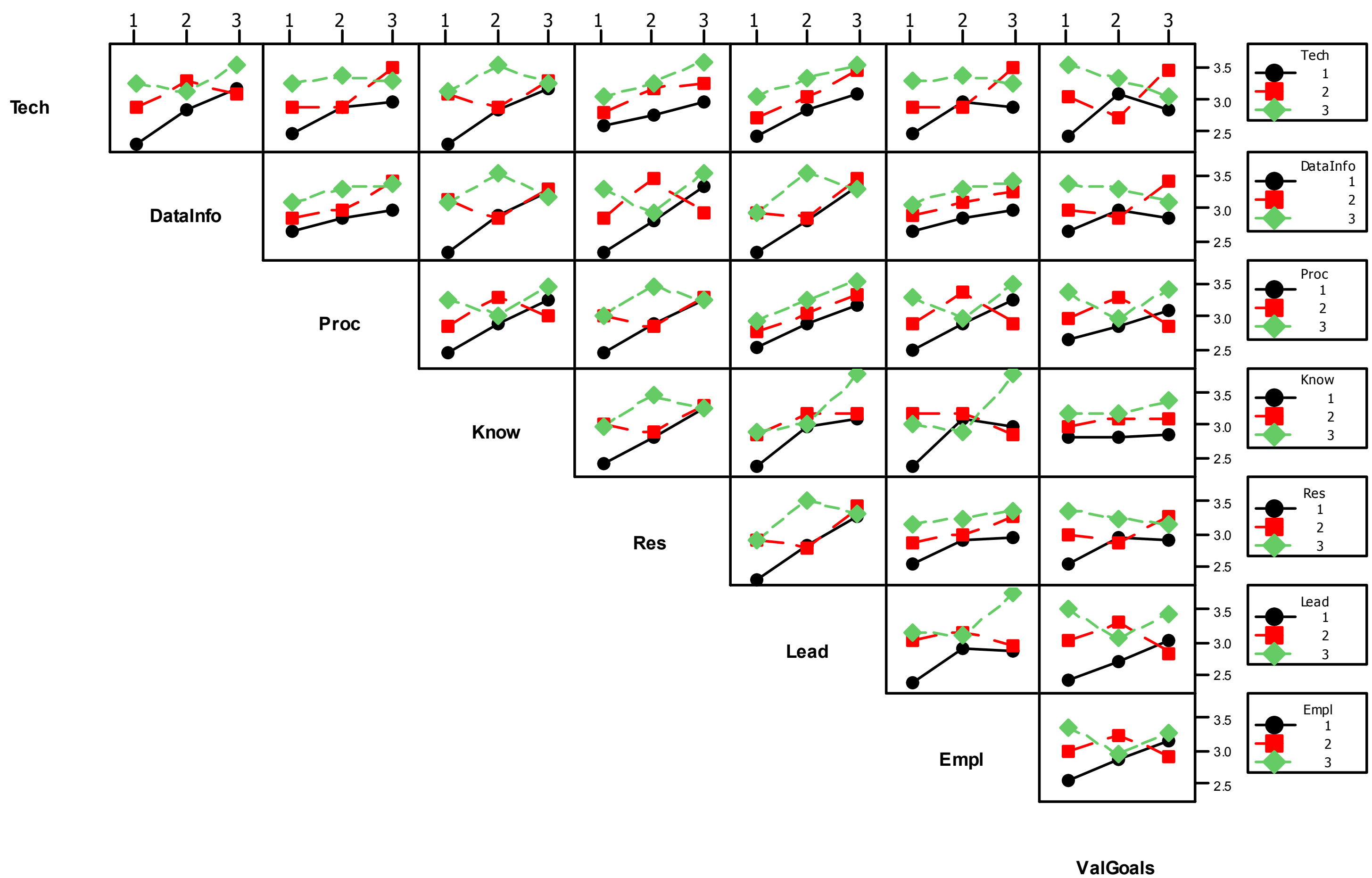

Figure 124. Interaction Graph for Sample Segments (Mobile ICT Deployed)

Analysis of Variance for Average(M-yes), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.27697	1.27697	0.63848	55.46	0.000
DataInfo	2	0.87653	0.87653	0.43827	38.07	0.000
Proc	2	0.69228	0.69228	0.34614	30.07	0.000
Know	2	0.76854	0.76854	0.38427	33.38	0.000
Res	2	0.97507	0.97507	0.48753	42.35	0.000
Lead	2	1.82643	1.82643	0.91321	79.33	0.000
Empl	2	0.56433	0.56433	0.28216	24.51	0.000
ValGoals	2	0.08264	0.08264	0.04132	3.59	0.067
Error	10	0.11512	0.11512	0.01151		
Total	26	7.17790				

S = 0.107293   R-Sq = 98.40%   R-Sq(adj) = 95.83%

Table 140. Avg. and Transformed Response w/ Design Matrix (No Mobile ICT)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.536	-0.811	1	1	1	1	1	1	1	1
2	2.750	-0.109	1	1	2	1	2	2	3	3
3	3.036	0.016	1	1	3	1	3	3	2	2
4	2.714	-0.125	1	2	1	2	2	3	1	2
5	2.714	-0.125	1	2	2	2	3	1	3	1
6	2.964	-0.016	1	2	3	2	1	2	2	3
7	3.250	0.109	1	3	1	3	3	2	1	3
8	3.500	0.222	1	3	2	3	1	3	3	2
9	2.929	-0.031	1	3	3	3	2	1	2	1
10	2.321	-0.307	2	1	1	2	2	2	2	1
11	3.214	0.093	2	1	2	2	3	3	1	3
12	2.786	-0.093	2	1	3	2	1	1	3	2
13	2.857	-0.062	2	2	1	3	3	1	2	2
14	2.821	-0.078	2	2	2	3	1	2	1	1
15	4.393	0.747	2	2	3	3	2	3	3	3
16	3.286	0.125	2	3	1	1	1	3	2	3
17	2.536	-0.205	2	3	2	1	2	1	1	2
18	3.679	0.307	2	3	3	1	3	2	3	1
19	3.714	0.325	3	1	1	3	3	3	3	1
20	2.714	-0.125	3	1	2	3	1	1	2	3
21	3.214	0.093	3	1	3	3	2	2	1	2
22	2.786	-0.093	3	2	1	1	1	2	3	2
23	3.500	0.222	3	2	2	1	2	3	2	1
24	3.036	0.016	3	2	3	1	3	1	1	3
25	3.214	0.093	3	3	1	2	2	1	3	3
26	3.786	0.361	3	3	2	2	3	2	2	2
27	3.500	0.222	3	3	3	2	1	3	1	1

Regression equation

```
Average(M-no) = - 0.415 + 0.226 Tech + 0.244 DataInfo + 0.214 Proc + 0.180 Know
                + 0.189 Res + 0.363 Lead + 0.206 Empl + 0.117 ValGoals
```

Predictor	Coef	SE Coef	T	P
Constant	-0.4154	0.1726	-2.41	0.027
Tech	0.22617	0.03020	7.49	0.000
DataInfo	0.24417	0.03020	8.09	0.000
Proc	0.21439	0.03020	7.10	0.000
Know	0.18039	0.03020	5.97	0.000
Res	0.18850	0.03020	6.24	0.000
Lead	0.36306	0.03020	12.02	0.000
Empl	0.20639	0.03020	6.83	0.000
ValGoals	0.11706	0.03020	3.88	0.001

S = 0.128120   R-Sq = 96.2%   R-Sq(adj) = 94.5%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.43241	0.92905	56.60	0.000
Residual Error	18	0.29547	0.01641		
Total	26	7.72787			

Regression equation

```
z (M-no) = - 1.74 + 0.110 Tech + 0.118 DataInfo + 0.112 Proc + 0.0962 Know
           + 0.0937 Res + 0.177 Lead + 0.109 Empl + 0.0672 ValGoals
```

Predictor	Coef	SE Coef	T	P
Constant	-1.73700	0.08525	-20.38	0.000
Tech	0.11022	0.01492	7.39	0.000
DataInfo	0.11783	0.01492	7.90	0.000
Proc	0.11150	0.01492	7.48	0.000
Know	0.09622	0.01492	6.45	0.000
Res	0.09372	0.01492	6.28	0.000
Lead	0.17722	0.01492	11.88	0.000
Empl	0.10889	0.01492	7.30	0.000
ValGoals	0.06717	0.01492	4.50	0.000

S = 0.0632811   R-Sq = 96.3%   R-Sq(adj) = 94.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.87712	0.23464	58.59	0.000
Residual Error	18	0.07208	0.00400		
Total	26	1.94920			

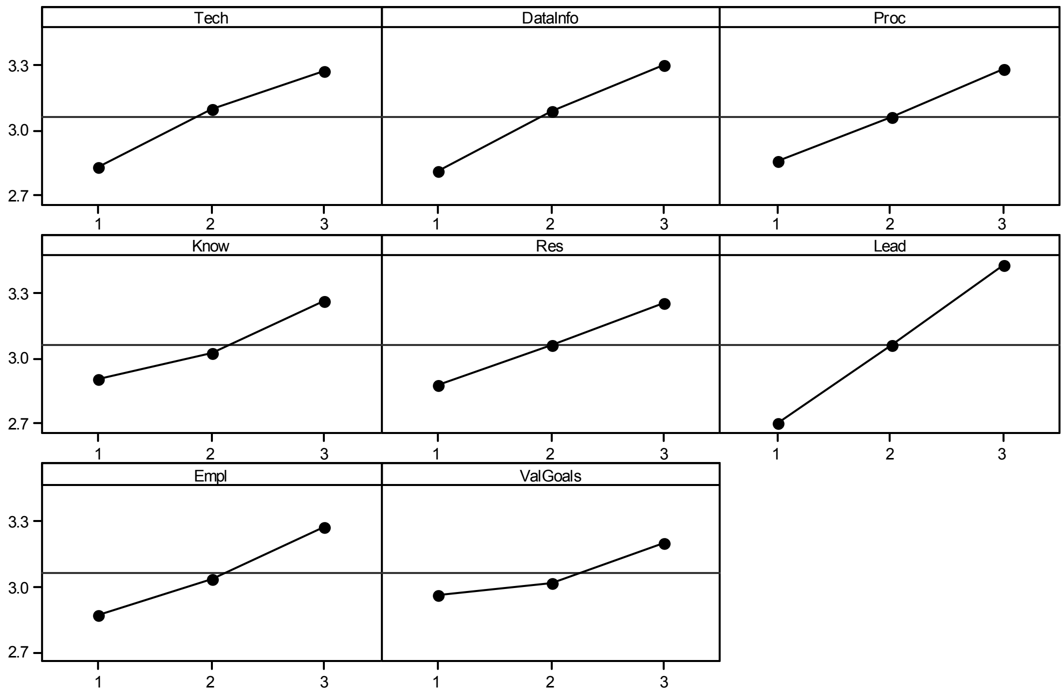

Figure 125. Main Effect Graph for Sample Segments (Mobile ICT Not Deployed)

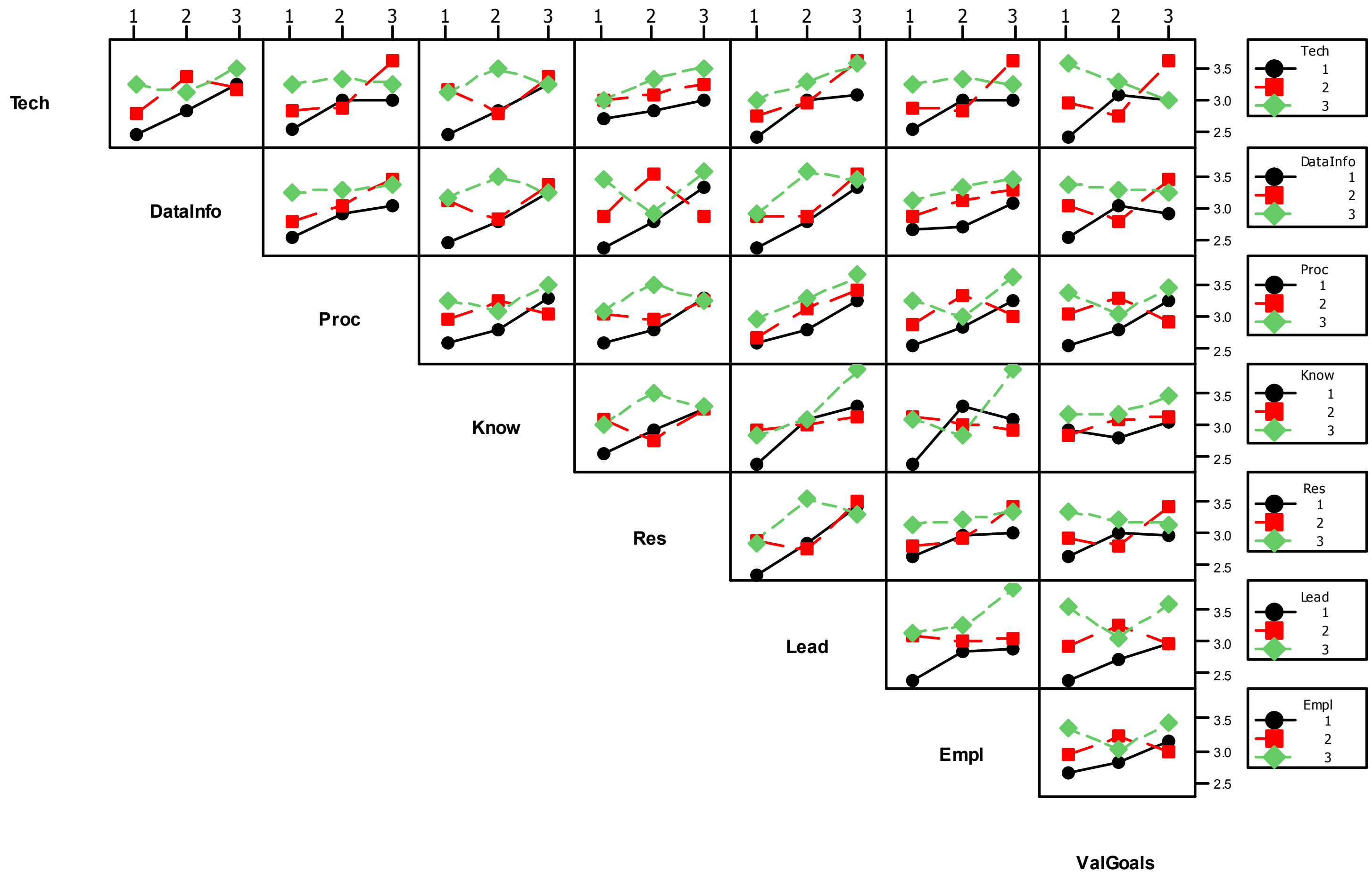

Figure 126. Interaction Graph for Sample Segments (Mobile ICT Not Deployed)

Analysis of Variance for Average(M-no), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	0.93671	0.93671	0.46835	21.22	0.000
DataInfo	2	1.07989	1.07989	0.53995	24.46	0.000
Proc	2	0.82772	0.82772	0.41386	18.75	0.000
Know	2	0.60858	0.60858	0.30429	13.78	0.001
Res	2	0.63961	0.63961	0.31980	14.49	0.001
Lead	2	2.37259	2.37259	1.18630	53.74	0.000
Empl	2	0.77277	0.77277	0.38639	17.50	0.001
ValGoals	2	0.26925	0.26925	0.13462	6.10	0.019
Error	10	0.22076	0.22076	0.02208		
Total	26	7.72787				

S = 0.148579   R-Sq = 97.14%   R-Sq(adj) = 92.57%

Table 141. Avg. and Transformed Response w/ Design Matrix (Mobile Strategy)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.453	-0.894	1	1	1	1	1	1	1	1
2	2.594	-0.179	1	1	2	1	2	2	3	3
3	3.094	0.041	1	1	3	1	3	3	2	2
4	2.813	-0.082	1	2	1	2	2	3	1	2
5	2.750	-0.109	1	2	2	2	3	1	3	1
6	2.938	-0.027	1	2	3	2	1	2	2	3
7	3.156	0.068	1	3	1	3	3	2	1	3
8	3.516	0.229	1	3	2	3	1	3	3	2
9	3.047	0.020	1	3	3	3	2	1	2	1
10	2.734	-0.116	2	1	1	2	2	2	2	1
11	3.234	0.102	2	1	2	2	3	3	1	3
12	2.656	-0.151	2	1	3	2	1	1	3	2
13	2.859	-0.061	2	2	1	3	3	1	2	2
14	2.766	-0.102	2	2	2	3	1	2	1	1
15	4.266	0.648	2	2	3	3	2	3	3	3
16	3.063	0.027	2	3	1	1	1	3	2	3
17	2.547	-0.200	2	3	2	1	2	1	1	2
18	3.641	0.288	2	3	3	1	3	2	3	1
19	3.859	0.399	3	1	1	3	3	3	3	1
20	2.797	-0.089	3	1	2	3	1	1	2	3
21	3.219	0.095	3	1	3	3	2	2	1	2
22	2.844	-0.068	3	2	1	1	1	2	3	2
23	3.359	0.158	3	2	2	1	2	3	2	1
24	2.953	-0.020	3	2	3	1	3	1	1	3
25	3.078	0.034	3	3	1	2	2	1	3	3
26	3.859	0.399	3	3	2	2	3	2	2	2
27	3.500	0.222	3	3	3	2	1	3	1	1

Regression equation

```
Average(Mstrat-yes) = - 0.300 + 0.228 Tech + 0.209 DataInfo + 0.192 Proc
                      + 0.219 Know + 0.215 Res + 0.365 Lead + 0.198 Empl
                      + 0.0539 ValGoals
```

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.3004	0.1233	-2.44	0.025
Tech	0.22817	0.02157	10.58	0.000
DataInfo	0.20928	0.02157	9.70	0.000
Proc	0.19194	0.02157	8.90	0.000
Know	0.21872	0.02157	10.14	0.000
Res	0.21511	0.02157	9.98	0.000
Lead	0.36467	0.02157	16.91	0.000
Empl	0.19794	0.02157	9.18	0.000
ValGoals	0.05389	0.02157	2.50	0.022

S = 0.0914926   R-Sq = 98.0%   R-Sq(adj) = 97.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.23384	0.90423	108.02	0.000
Residual Error	18	0.15068	0.00837		
Total	26	7.38451			

Regression equation

```
z (Mstrat-yes) = - 1.71 + 0.115 Tech + 0.104 DataInfo + 0.101 Proc + 0.114 Know
                 + 0.109 Res + 0.179 Lead + 0.106 Empl + 0.0388 ValGoals
```

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-1.70759	0.07169	-23.82	0.000
Tech	0.11461	0.01254	9.14	0.000
DataInfo	0.10439	0.01254	8.32	0.000
Proc	0.10050	0.01254	8.01	0.000
Know	0.11411	0.01254	9.10	0.000
Res	0.10889	0.01254	8.68	0.000
Lead	0.17856	0.01254	14.23	0.000
Empl	0.10567	0.01254	8.42	0.000
ValGoals	0.03878	0.01254	3.09	0.006

S = 0.0532185   R-Sq = 97.3%   R-Sq(adj) = 96.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	1.86412	0.23302	82.27	0.000
Residual Error	18	0.05098	0.00283		
Total	26	1.91510			

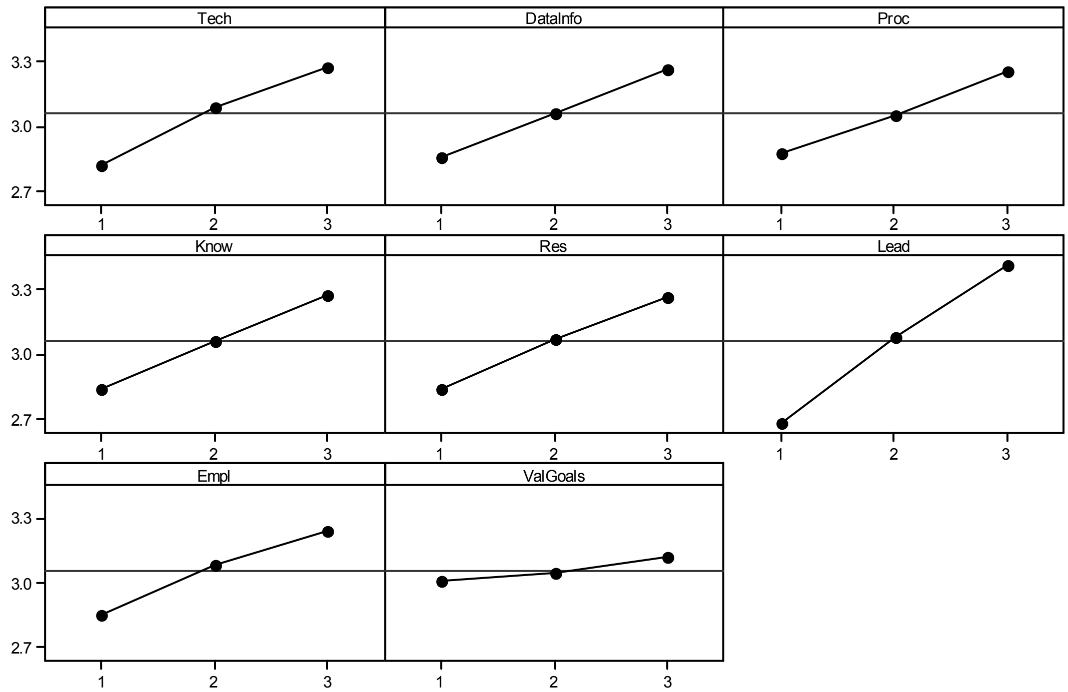

Figure 127. Main Effect Graph for Sample Segments (Mobile ICT Strategy)

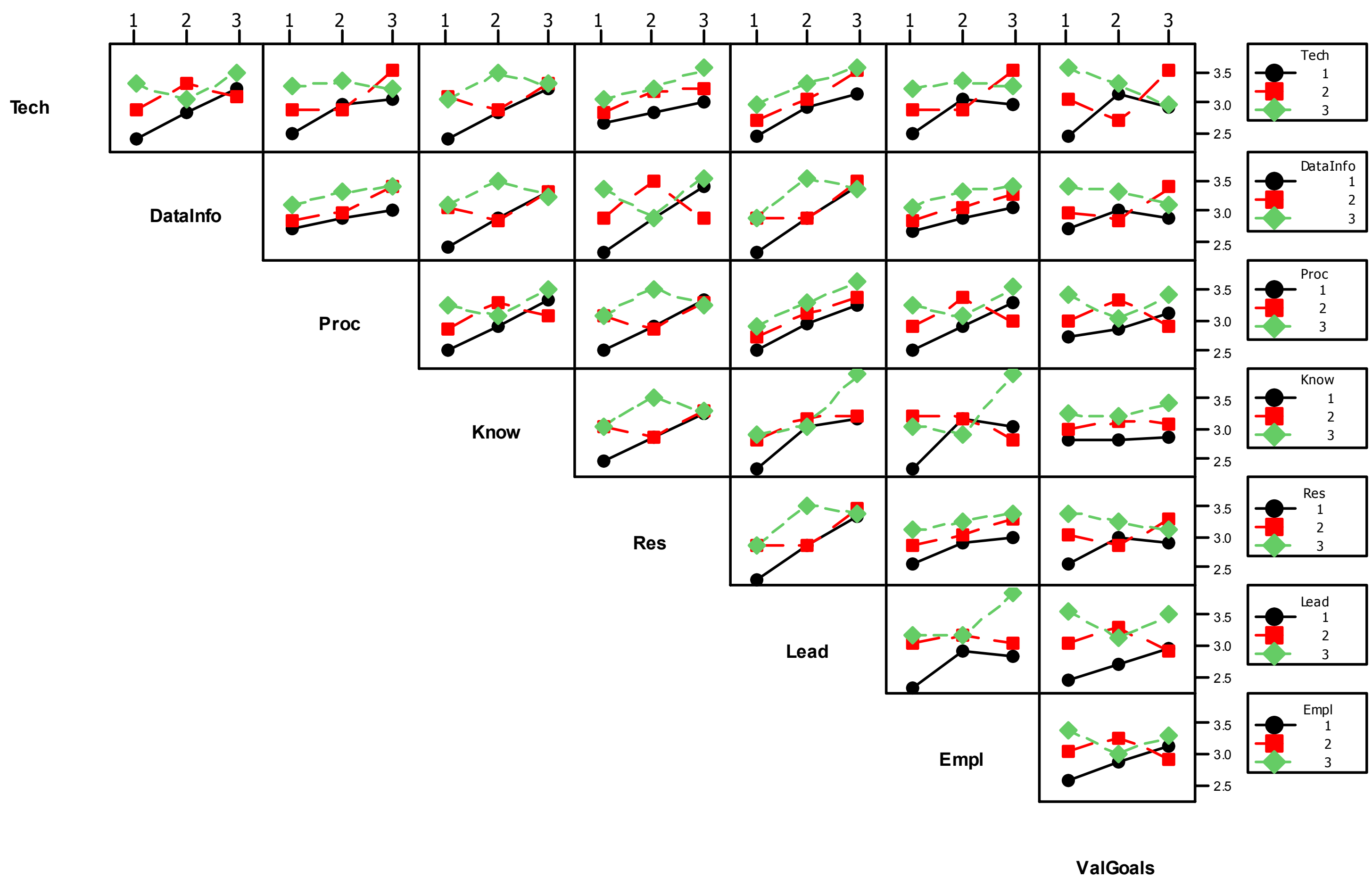

Figure 128. Interaction Graph for Sample Segments (Mobile ICT Strategy)

Analysis of Variance for Average(Mstrat-yes), using Adjusted SS for Tests

Source	**DF**	**Seq SS**	**Adj SS**	**Adj MS**	**F**	**P**
Tech	2	0.94623	0.94623	0.47312	40.04	0.000
DataInfo	2	0.78839	0.78839	0.39420	33.36	0.000
Proc	2	0.66517	0.66517	0.33259	28.15	0.000
Know	2	0.86126	0.86126	0.43063	36.45	0.000
Res	2	0.83553	0.83553	0.41776	35.36	0.000
Lead	2	2.40169	2.40169	1.20084	101.64	0.000
Empl	2	0.71322	0.71322	0.35661	30.18	0.000
ValGoals	2	0.05486	0.05486	0.02743	2.32	0.149
Error	10	0.11815	0.11815	0.01182		
Total	26	7.38451				

S = 0.108697   R-Sq = 98.40%   R-Sq(adj) = 95.84%

Table 142. Avg. and Transformed Response w/ Design Matrix (No M-Strategy)

Profile	Average Response	z	Tech	Data Info	Proc	Know	Res	Lead	Empl	Val Goals
1	1.444	-0.903	1	1	1	1	1	1	1	1
2	2.489	-0.227	1	1	2	1	2	2	3	3
3	2.889	-0.048	1	1	3	1	3	3	2	2
4	2.689	-0.136	1	2	1	2	2	3	1	2
5	2.778	-0.097	1	2	2	2	3	1	3	1
6	2.933	-0.029	1	2	3	2	1	2	2	3
7	3.111	0.048	1	3	1	3	3	2	1	3
8	3.289	0.126	1	3	2	3	1	3	3	2
9	2.844	-0.068	1	3	3	3	2	1	2	1
10	2.422	-0.258	2	1	1	2	2	2	2	1
11	3.222	0.097	2	1	2	2	3	3	1	3
12	2.711	-0.126	2	1	3	2	1	1	3	2
13	2.911	-0.039	2	2	1	3	3	1	2	2
14	2.778	-0.097	2	2	2	3	1	2	1	1
15	4.200	0.602	2	2	3	3	2	3	3	3
16	3.044	0.019	2	3	1	1	1	3	2	3
17	2.622	-0.166	2	3	2	1	2	1	1	2
18	3.622	0.279	2	3	3	1	3	2	3	1
19	3.578	0.258	3	1	1	3	3	3	3	1
20	2.778	-0.097	3	1	2	3	1	1	2	3
21	3.200	0.087	3	1	3	3	2	2	1	2
22	2.756	-0.107	3	2	1	1	1	2	3	2
23	3.444	0.196	3	2	2	1	2	3	2	1
24	3.311	0.136	3	2	3	1	3	1	1	3
25	3.356	0.156	3	3	1	2	2	1	3	3
26	3.889	0.415	3	3	2	2	3	2	2	2
27	3.444	0.196	3	3	3	2	1	3	1	1

Regression equation

```
Average(Mstrat-no) = - 0.407 + 0.294 Tech + 0.249 DataInfo + 0.213 Proc
                     + 0.170 Know + 0.230 Res + 0.280 Lead + 0.164 Empl
                     + 0.116 ValGoals
```

Predictor	**Coef**	**SE Coef**	**T**	**P**
Constant	-0.4071	0.1497	-2.72	0.014
Tech	0.29389	0.02619	11.22	0.000
DataInfo	0.24933	0.02619	9.52	0.000
Proc	0.21350	0.02619	8.15	0.000
Know	0.17044	0.02619	6.51	0.000
Res	0.22967	0.02619	8.77	0.000
Lead	0.28022	0.02619	10.70	0.000
Empl	0.16433	0.02619	6.28	0.000
ValGoals	0.11611	0.02619	4.43	0.000

S = 0.111108   R-Sq = 97.0%   R-Sq(adj) = 95.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	8	7.10874	0.88859	71.98	0.000
Residual Error	18	0.22221	0.01234		
Total	26	7.33095			

Regression equation

```
z (Mstrat-no) = - 1.75 + 0.143 Tech + 0.123 DataInfo + 0.111 Proc + 0.0912 Know
                + 0.115 Res + 0.140 Lead + 0.0890 Empl + 0.0666 ValGoals
```

Predictor	Coef	SE Coef	T	P
Constant	-1.74863	0.07361	-23.76	0.000
Tech	0.14300	0.01288	11.10	0.000
DataInfo	0.12344	0.01288	9.59	0.000
Proc	0.11061	0.01288	8.59	0.000
Know	0.09117	0.01288	7.08	0.000
Res	0.11483	0.01288	8.92	0.000

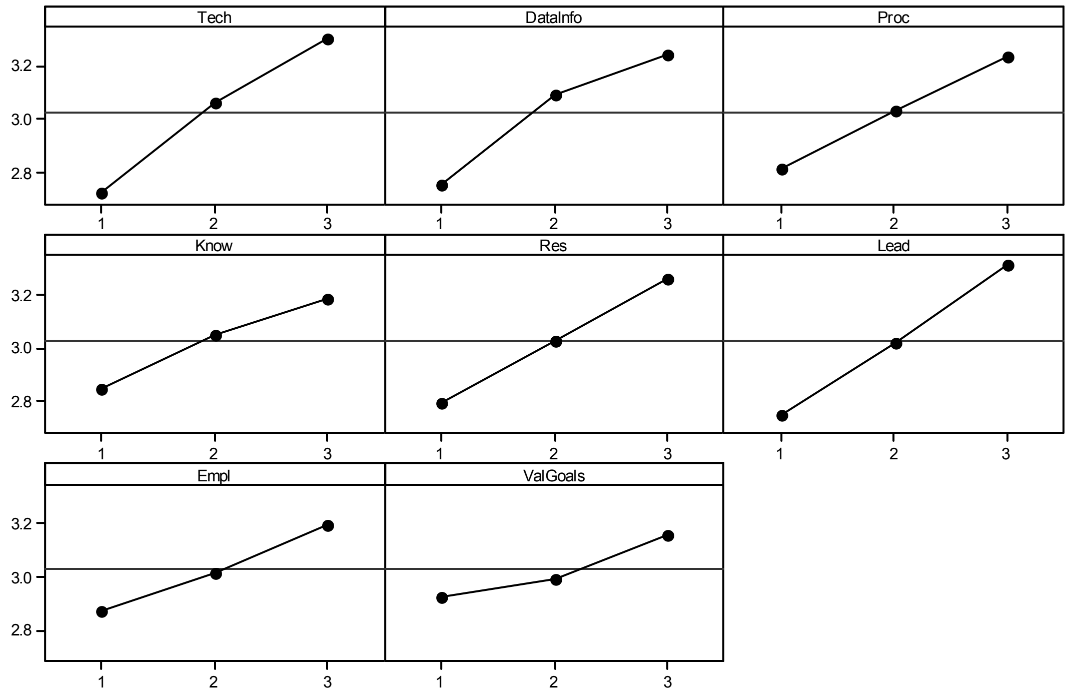

Figure 129. Main Effect Graph for Sample Segments (No Mobile ICT Strategy)

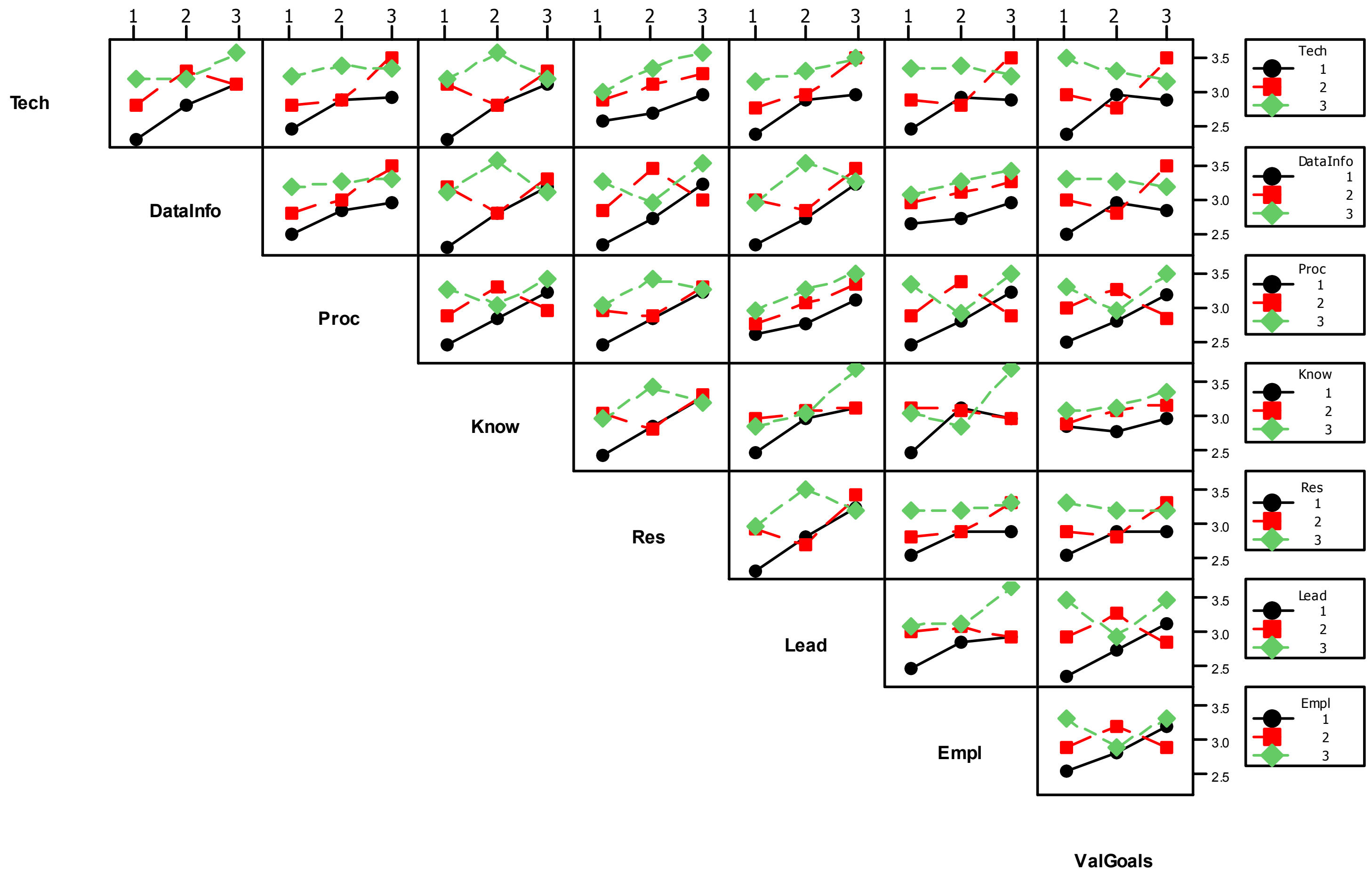

Figure 130. Interaction Graph for Sample Segments (No Mobile ICT Strategy)

Analysis of Variance for Average(Mstrat-no), using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Tech	2	1.56780	1.56780	0.78390	57.69	0.000
DataInfo	2	1.16918	1.16918	0.58459	43.02	0.000
Proc	2	0.82072	0.82072	0.41036	30.20	0.000
Know	2	0.52911	0.52911	0.26456	19.47	0.000
Res	2	0.94948	0.94948	0.47474	34.93	0.000
Lead	2	1.41388	1.41388	0.70694	52.02	0.000
Empl	2	0.48768	0.48768	0.24384	17.94	0.000
ValGoals	2	0.25721	0.25721	0.12860	9.46	0.005
Error	10	0.13589	0.13589	0.01359		
Total	26	7.33095				

S = 0.116573   R-Sq = 98.15%   R-Sq(adj) = 95.18%

APPENDIX E:

WEB-BASED READINESS DIAGNOSTIC TOOL

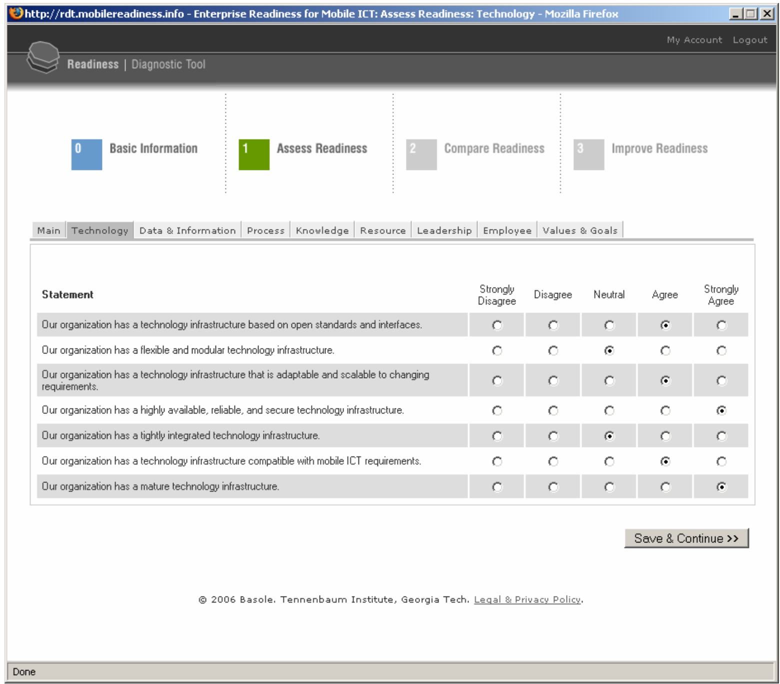

Figure 131. Technology Readiness Assessment Screen, RDT

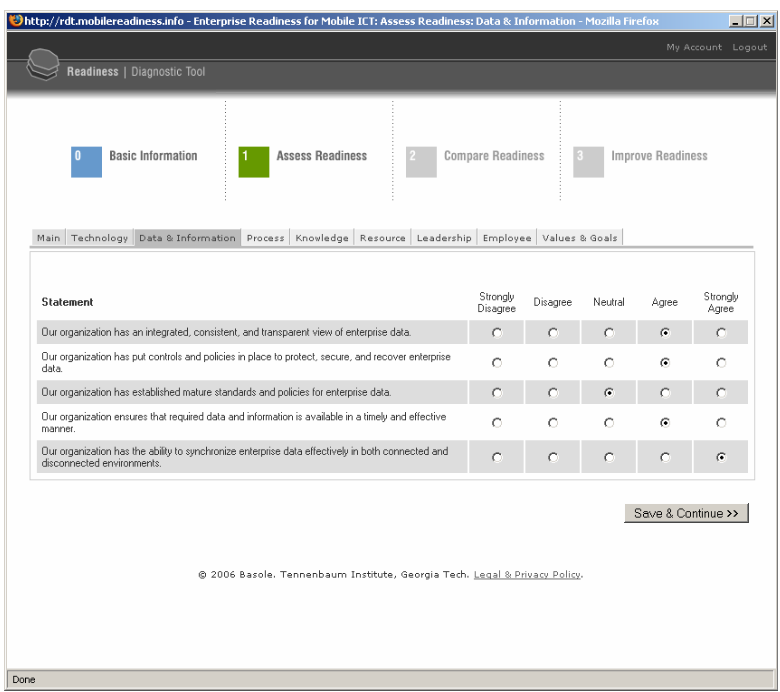

Figure 132. Data & Information Readiness Assessment Screen, RDT

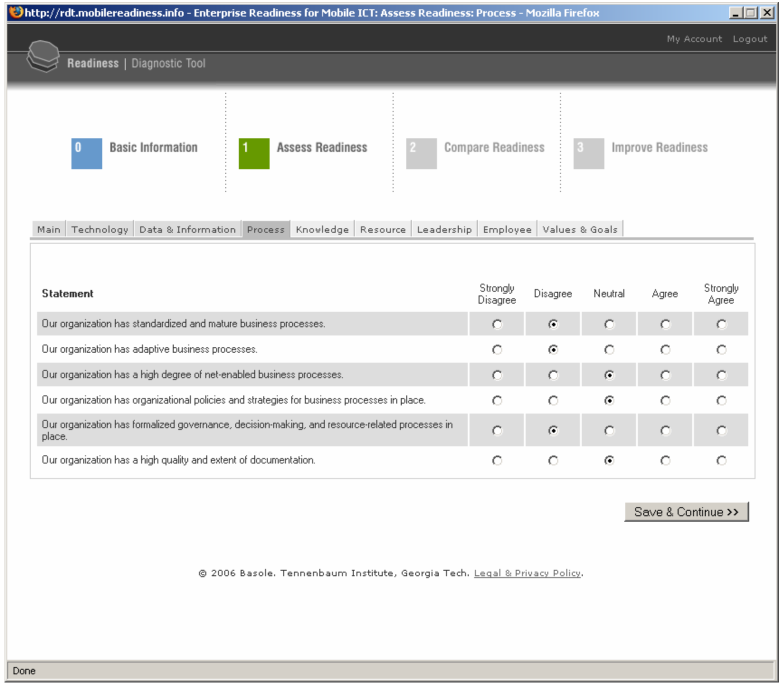

Figure 133. Process Readiness Assessment Screen, RDT

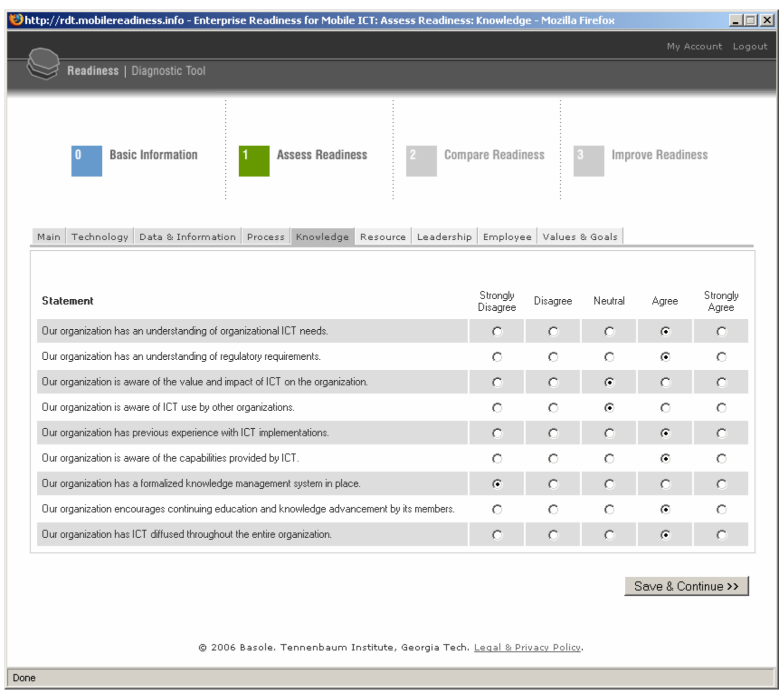

Figure 134. Knowledge Readiness Assessment Screen, RDT

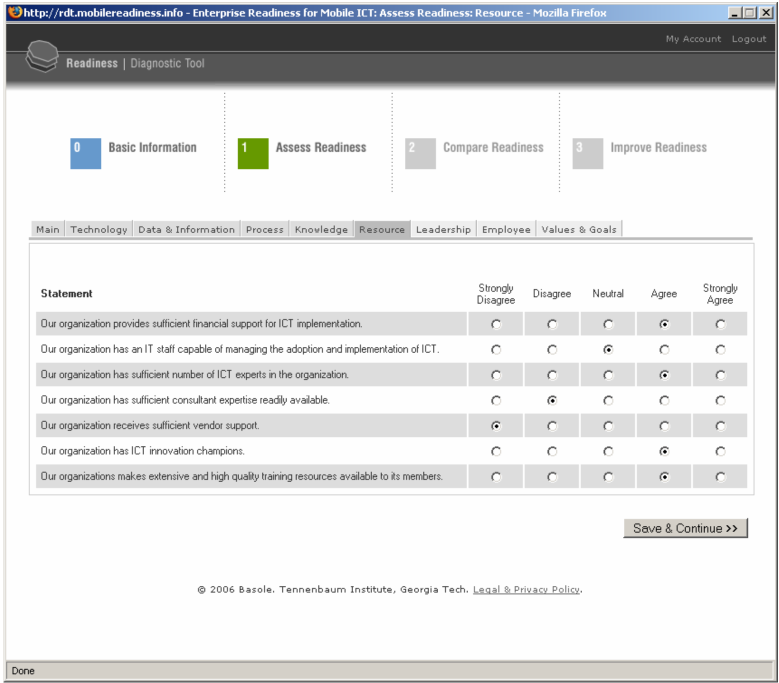

Figure 135. Resource Readiness Assessment Screen, RDT

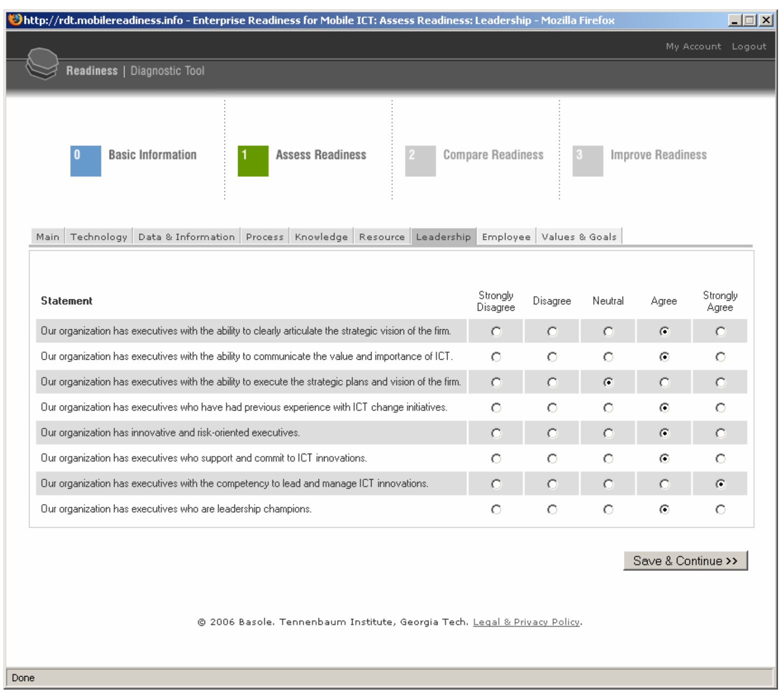

Figure 136. Leadership Readiness Assessment Screen, RDT

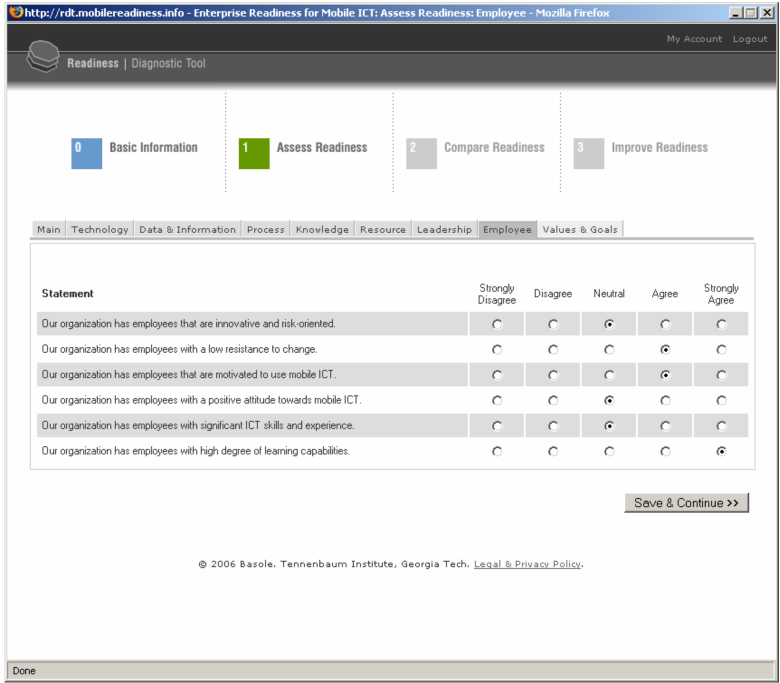

Figure 137. Employee Readiness Assessment Screen, RDT

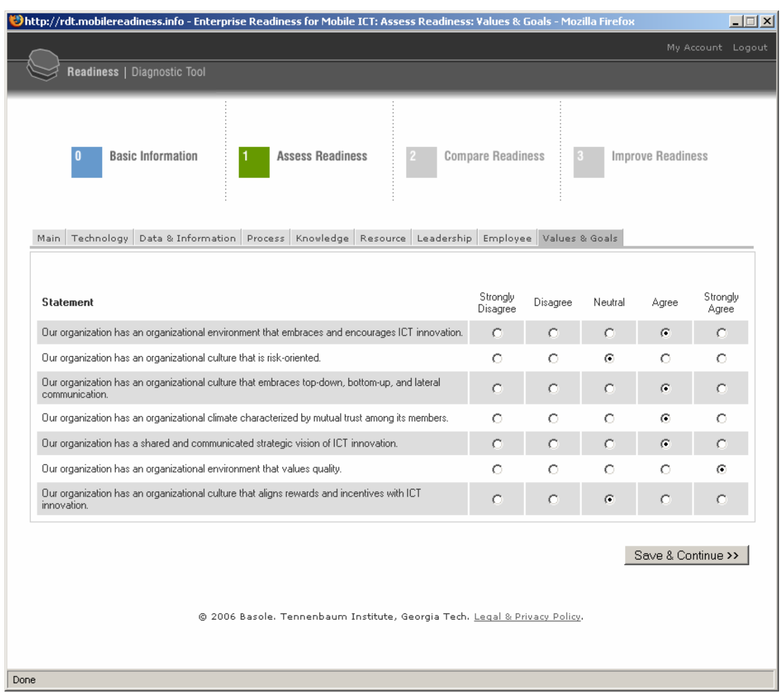

Figure 138. Values & Goals Readiness Assessment Screen, RDT

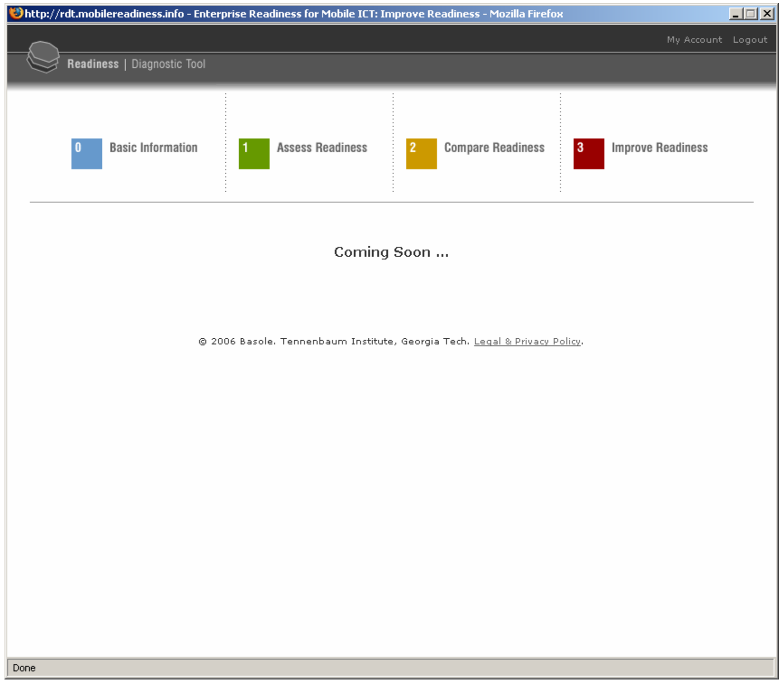

Figure 139. Improve Readiness Screen, RDT

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